twogether

Paper Technology Journal

News from the Divisions:
CompactPulper – the new generation of Voith broke pulpers.

The success story of Shandong Huatai Paper and Voith Paper keeps on rolling.

Adolf Jass, Germany – complete production line for packaging papers.

PrintFlex P – development of a new press fabric concept.

Paper Culture:
Japanese Paper Blossoms Anew.

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Title page: Traditional production of Japanese Paper

Hans Müller

Dear Customer, Dear Reader,

In our last issue of twogether (No. 16) I stated that the 10th business year of the "new Voith Paper" could develop into one of the best ever as far as sales is concerned. I am now pleased to say that it will happen, and we appreciate the reception and confidence we are receiving worldwide from the pulp and paper industry.

It's also important to note that the close cooperation between Voith Paper and Voith Fabrics continues to show impressive results that will deliver innovative, unique technology, products and services.

Focusing our strategy away from worldwide consolidation of the supplier network toward growth through innovation is evidenced by the decision of the Voith Group Board of Management to invest in the most modern, up-to-date Process Technology Center (PTC), which will be built in Heidenheim, Germany. The heart of this PTC will be our pilot paper machine and its infrastructure, which will allow pilot trials to develop processes and paper products that closely resemble mill conditions.

I'd also like to draw your attention to the article on page 2 that discusses the use of mixed tropical hardwood as a raw-material base for the pulp and paper industry. Much has been written and, unfortunately, misrepresented regarding this raw material source. The article, written by Jaakko Pöyry, has been included in our magazine to show the responsible behavior of the pulp and paper industry regarding its highly valued worldwide resource – the forests.

I wish you all the best and enjoyable reading.

Hans Müller
on behalf of the Voith Paper Technology team

Mixed Tropical Hardwood –
a minor and declining source of fibre for paper

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Economic Growth will be Fastest in Asia and Eastern Europe

Economic growth continues to be a major driver for paper demand. Despite the current economic slowdown in the West and Japan, the global economy is expected to grow at a rate of 2.9 %/a in the long term. The long-term GDP growth will be fastest in China, Asia-Pacific and Eastern Europe including Russia (4-7 %/a), while in North America, Western Europe and Japan the growth is expected to remain at a much lower level (1.5-2.5 %/a).

World demand for paper and paperboard is expected to grow at a rate of 2.2 %/a, reaching 453 million tons by the year 2015 **(Fig. 1)**.

Because of the above mentioned differences in economic growth, paper and paperboard production prospects vary considerably between regions, with a fairly modest growth for North America, Western Europe and Japan, but still significant growth potential for Asia, Latin America and Eastern Europe **(Fig. 2)**. In relative terms, the paper industry will grow fastest in Eastern Europe (4.9 %/a), Asia excl. Japan (4.4 %/a) and Latin America (3.9 %/a). The main growth areas will be China/the rest of Asia accounting for 46 % of the projected global production growth through 2015.

This means that, due to the non uniform growth of paper and paperboard production, the traditional supply areas such as North America and Western Europe will become gradually less important. However, these regions will continue to dominate the world paper industry, accounting for over 50 % of the global production by 2015.

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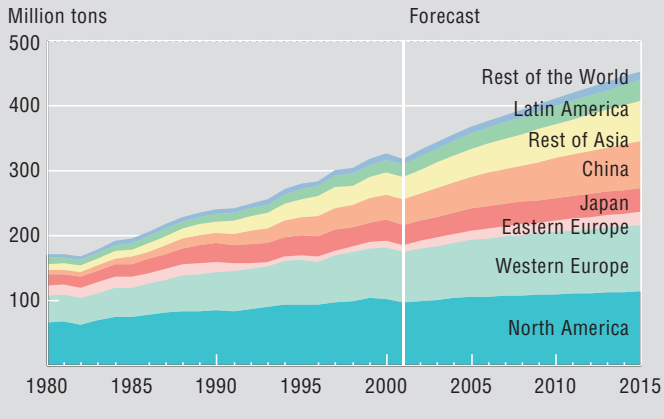

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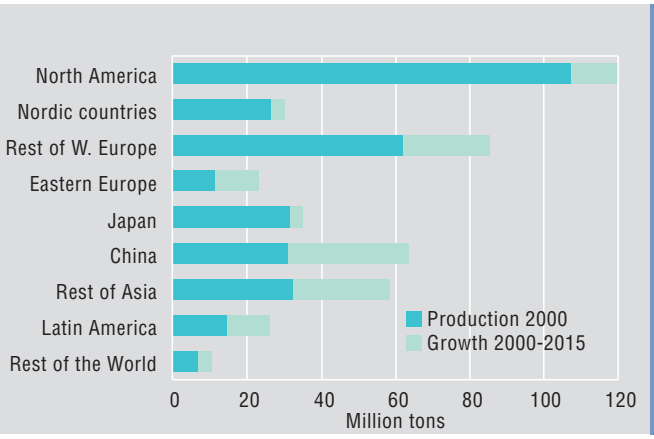

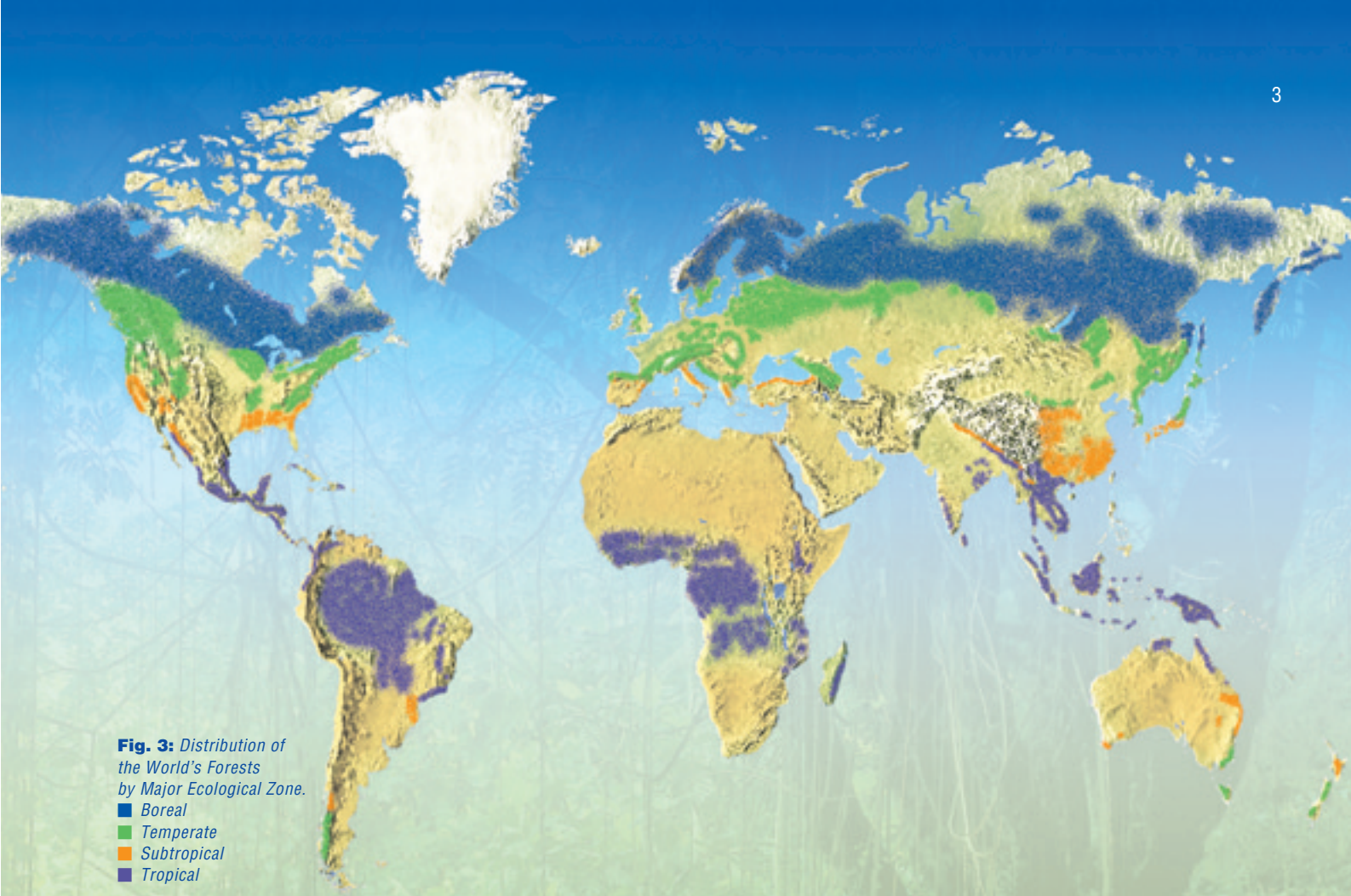

Fig. 3: *Distribution of the World's Forests by Major Ecological Zone.*
- *Boreal*
- *Temperate*
- *Subtropical*
- *Tropical*

World Fiber Sources for Paper Making

Dependent on the climate (ecological zone), different wood species are available as a fiber source for paper making (Fig. 3). Paper maker distinguish between hardwood and softwood.

The main virgin fiber sources in Western/ Eastern Europe and North America for paper making are spruce, fir, pine, beech, birch, oak and chest nut. South America paper industry uses mainly pine, eucalypt and acacia for paper making. **Mixed tropical hardwood (MTH)** is used for paper production mainly in Asia, thanks to the regions huge forests. Because of its growing paper production, the region's industry is facing new challenges in meeting its fibre needs, i.e. some local forest and other fibre resources are scarce. As a result, Asia, particularly China, will become increasingly dependent on imported fibre.

Mixed tropical hardwood is a generally accepted term referring to wood from natural tropical forests. The term refers to a specific characteristic of natural tropical forests, namely the large number of wood species.

World Consumption of Paper-making Fibers

Cost-cutting pressures are one of the main drivers of fiber mix changes in the paper industry, though there are many other factors involved, including paper quality requirements, changing mill and process requirements, pulp quality changes, increasing use of pigments/ fillers etc. In general, the share of mechanical/semi-chemical pulp is decreasing in all key paper industry product areas because of the growing use of recovered paper.

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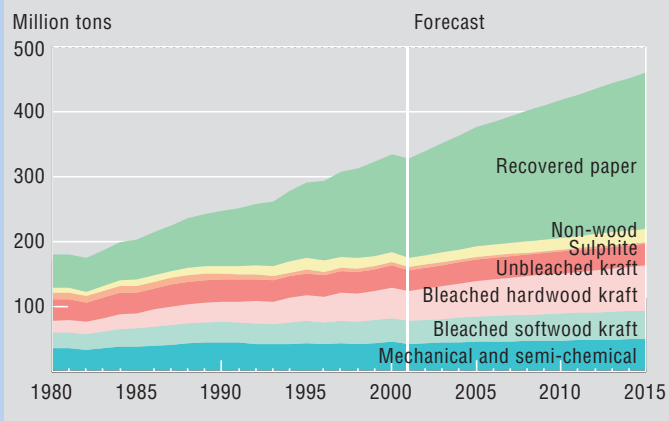

Fig. 1: *World Demand for Paper and Paperboard by Region 1980-2015.*

Fig. 2: *Paper and Paperboard Production by Region 2000 and 2015.*

Fig. 4: *World Consumption of Papermaking Fibre 1980-2015.*

Fig. 5: *Total BHKP Consumption in the World by Subgrade.*

Fig. 6: *Furnish Composition of Fine Paper.*

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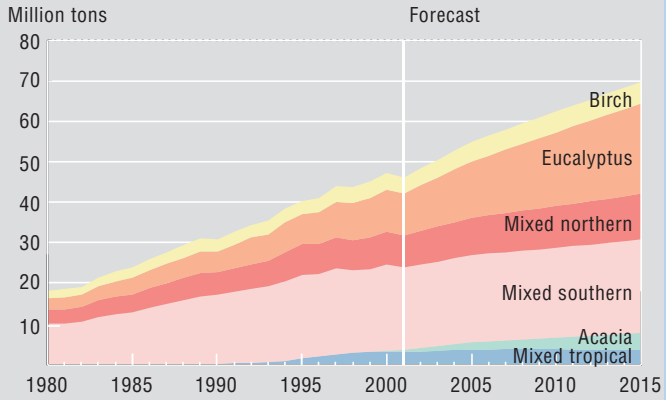

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	Copy Paper	Writing and Printing Paper (uncoated)	Art Paper (coated)
Weight (g/m^2)	80	70-120	70-170
Softwood Pulp (%)	0-15	0-20	10-60
Hardwood Pulp (%)	85-100	80-100	40-90
Filler (%)	17-25	10-25	10-20
Coating Pigment (%)			up to 60 %, based on base paper

The total paper making fiber consumption at 2002 is about 325 million t and it will be about 460 million t at 2015. It is important to know that recovered paper provides already 50 % of the worlds consumption of paper making fiber. Bleached hardwood kraft consumption is also expected to increase and MTH contributes as one source among many others (Fig. 4). Bleached hardwood kraft pulp (BHKP) consumption will grow from 47.5 million t at 2002 up to 70 million t at 2015 (Fig. 5).

MTH Plays a Marginal Role in Pulp and Paper Production

The world production of MTH pulp is estimated at around 3.5 million tons (Fig. 5). This is about 1 % of the total papermaking fibre supply (325 million tons) and about 2 % of virgin wood pulp production (161 million tons). Indonesia currently accounts for most of the world's MTH pulp production.

Most of the MTH-pulp is used for the production of fine paper. Fine paper is a general term for Copy Papers, Woodfree Writing and Printing Papers (uncoated) and Art Papers (coated grades). The different papers consist mainly of reinforcement pulp (kraft pulp-long fiber), hardwood pulp such as e.g. MTH-pulp (short fiber) and filler material (calcium carbonate and/or clay). Further additives (starch, dye, e.g.) and coatings on art paper (pigments, binders, etc.) are a must in order to achieve further improvements on certain important paper properties (Fig. 6).

There are several reasons why MTH is not favoured from paper makers and paper machine suppliers. One of the most important is the large number of wood species, leading to large variations in the most important wood properties, which has an undesirable impact on the pulping process, and ultimately on pulp and paper quality. In some cases, for example the species with the highest density have to be separated before processing the raw material mix. The big variations in wood properties make it difficult to control and optimise the process, resulting in low yield.

Indonesia is the only country where MTH is used in large-scale pulp production. Driven by the growing demand for fibre in Asia, Indonesia's pulp production is expected to increase from 3.5 million tons in 2000 to 7.2 million tons in 2015. Pulp production provides, directly and indirectly, significant employment and income opportunities for a large number of rural people in remote areas. Despite the rapidly growing pulp production, the use of MTH is expected to decrease in line with the increasing use of plantation-grown acacia.

The main reason why MTH continues to be used in pulp production in Indonesia is that the plantation establishment and development programmes introduced in the 1980s have failed to keep pace with the rapid development of the industry. Pulpwood demand has increased more rapidly than the wood supply from plantations, regardless of the plantation programmes that all major companies have been developing since the 1980s.

Mixed Tropical Hardwood Mostly Used in Sawmilling and Plywood Manufacturing

The estimated MTH volume used globally for pulp production is 13 million m^3, i.e. about 10 % of the total industrial use of tropical wood. The balance is processed into sawnwood and plywood, and used mainly in construction, joinery and furniture industries.

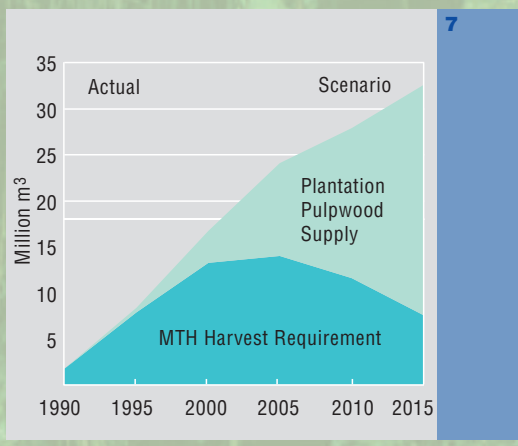
Production of tropical logs in ITTO (International Tropical Timber Organization) producer countries, which include the great majority of tropical countries and forests, decreased to 121 million m^3 in 2002. Most of this wood (111 million m^3) was processed within ITTO producer countries and the balance (10 million m^3) was exported to other countries (mainly to Japan and the EU) for processing. Roughly two thirds (74 million m^3) of the volume processed within ITTO countries was processed into sawnwood and one third (37 million m^3) into plywood.

Mixed Tropical Hardwood and Sustainability

Indonesia's plantation development programme was launched in the 1980s and became widely applied in the early 1990s, making Indonesia a leading plantation forest country in Southeast Asia. Industrial plantation forest concessions (called HTI concessions) with an area up to 300,000 ha were granted to interested parties. The pulpwood concession areas consisted of different types of land and forest, from tropical forests, already degraded by selective cutting of plylogs and sawlogs, to open grasslands. Any larger unlogged virgin forests were left out from the pulpwood concessions and smaller-scale undisturbed forests within the concessions were strictly protected, not allowing their conversion into plantations. As a result, most of the MTH pulpwood comes from conversion cuttings of degraded natural forests, which are mainly replanted by acacia and eucalypts.

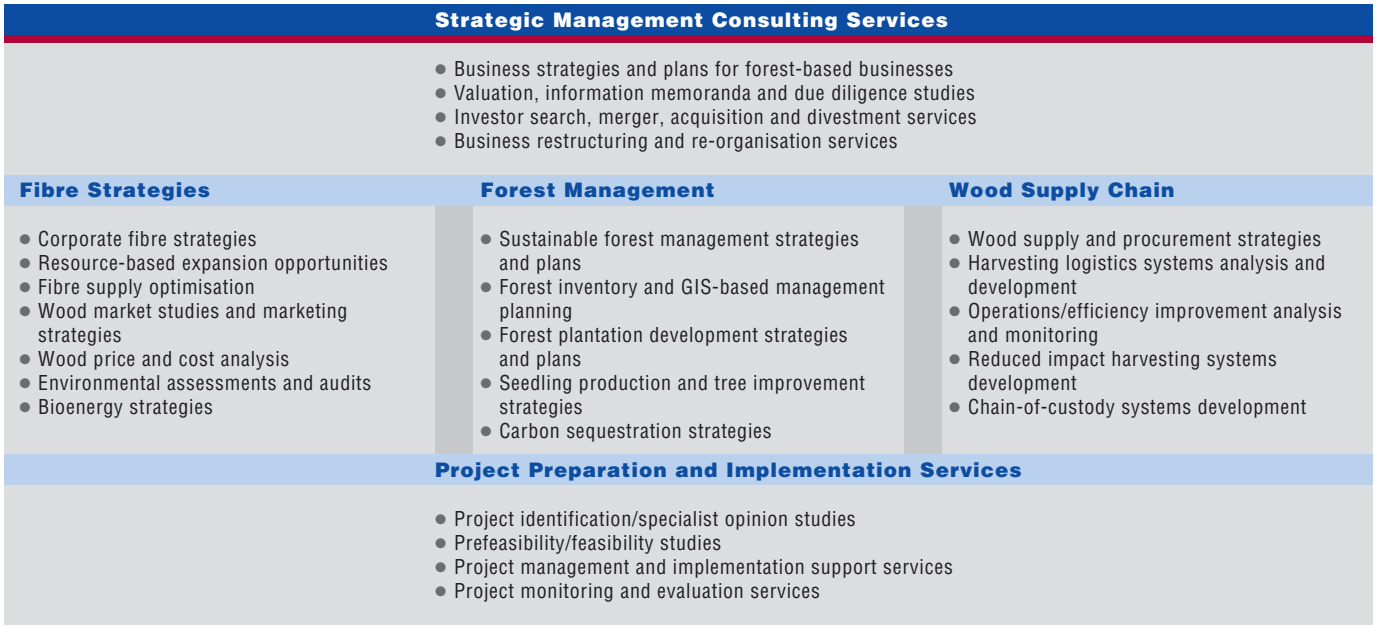
Typically, only 30-50 % of the granted gross concession area was suitable for plantation establishment. The balance included areas such as nature reserves, infrastructure areas and low-quality land unsuitable for planting. Since the 1980s, plantation development has been hampered by many factors such as insufficient funding, land ownership disputes and forest fires, and there is a continuous challenge to intensify plantation development to keep pace with the industry's capacity growth. Political changes in Indonesia have also put land-use issues high on the agenda, as local people have much more freedom and courage to speak for themselves than in Suharto's time. These changes were not anticipated in formulating the HTI pulpwood concession policies and they have difficulties in coping with these changes.

Fig. 7: *Pulpwood Demand Scenario in Indonesia.*



The first Indonesian pulp mill operating 100 % based on plantation wood is already in operation (the Musi mill in Sumatra). The use of plantation wood is steadily increasing also in other mills. There are different scenarios concerning the future acacia pulpwood supply and MTH pulpwood requirement in Indonesia. The scenario presented in Fig. 7 is con-

Fig. 8: *Forestry Services of Jaakko Pöyry Consulting.*



sidered conservative concerning the speed of conversion to plantation wood. The use of MTH in pulp production may decrease also faster depending on current/future planting rates in industrial plantations and economic availability of MTH pulpwood.

Tropical deforestation is driven by other factors than pulpwood plantations. Recent data concerning changes in the global forest area indicate that the forest area has remained unchanged or increased in non-tropical regions. The net loss of tropical forest area during the past decade (1990-2000) amounted to about 14.2 million ha annually, consisting of a total annual loss of 15.2 million ha, including 1.0 million hectares converted annually into forest plantations. According to the Food and Agriculture Organization of the United Nations, most of the deforestation across the tropics was due to the direct conversion of forest into permanent agricultural land or pastures, and to a lesser degree to the gradual intensification of shifting agriculture.

Assuming that the average MTH pulpwood volume in degraded tropical forest is 50-80 m^3/ha, the area needed annually to satisfy the annual MTH pulpwood requirement is some 160,000-260,000 ha. This means that the conversion of degraded natural forests into plantations would equal only about 1-2 % of the total tropical deforestation. Yet, it is important to note that this conversion is not regarded as deforestation, but as a change of the type of forest.

Jaakko Pöyry Consulting Services

Service offering of Jaakko Pöyry includes independent evaluation/assessment of sustainability of forestry practices of forest industries (including pulp producers) as well as other entities managing forest resources. These analyses aim at comprehensive view on sustainability of management of forest resources including conservation and biodiversity, sustainability of wood production, health and vitality of forests, soil and water quality, global carbon cycles, socio-economic benefits and cultural heritage **(Fig. 8)**.

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CompactPulper –
the new generation of Voith broke pulpers

New paper machines today are getting faster and wider all the time, with ever-increasing production tonnages, even for challenging paper grades. This also means more exacting demands on the operating efficiency of broke pulpers, since these must ensure reliable pulping of broke at all times and whatever the circumstances.

Fig. 1: *Previous AK design.*

Fig. 2: *New CompactPulper design.*

Fig. 3: *3D presentation of the new Compact-Pulper.*

Fig. 4: *Chest widths: comparison between conventional and new design.*

At sheet breaks the broke pulper must reach full operating speed from start-up in the shortest possible time. The procedure is as follows:

As soon as a sheet break is detected, the sheet is diverted directly into the broke pulper located ahead of the sheet break. At the same time the showers open, and the sheet is wetted and pulled down with the water flow. In the meantime, the pulper rotors have reached full speed, generating enough circulation energy to draw in the sheet, which is then rapidly pulped down and pumped off through the pulper screenplate.

Based on Voith's long experience, with over 375 AK series pulpers delivered since 1990, the objective of this development project was to further increase broke pulper efficiency whilst at the same time reducing investment costs.

Slushing conditions in the broke pulper seem simple at first sight, but a closer look quickly reveals just how many boundary conditions have to be simultaneously taken into account in order to ensure reliable operation:

- Paper machine width and speed
- Paper grade, basis weight and location of the sheet break in the machine
- Pulping intensity and suspension level
- Dwelltime
- Broke removal rate through the pulper screenplate.

Additionally, the pulping consistency has to keep within certain limits to ensure a reliable sheet draw-in, good pulping and stable pump operation.

The development project was carried out on two levels due to the complexity of the process and also the need for field trials:

- A full-size trial pulper, incorporating the new optimized geometry of the CompactPulper, was tested in Voith Paper's Technology Center. This enabled intensive investigation of machine parameters which usually cannot be changed in mill operation
- Extensive mill trials and comparison with the Technology Center's trial results.

Figs. 1 and 2 show the differences between the conventional broke pulper design and the new CompactPulper.

The trials clearly showed that a large part of broke pulping energy is used for moving the stock round. Compared with pulpers for slushing recovered paper or virgin fiber pulp, in broke pulpers the sheet is brought into the pulper in a clearly defined way. It has already been thoroughly wetted on both sides by the showers. This means that pulper dwelltime is reduced by the time otherwise required for breaking down and wetting the paper when presented in bale form.The pulper chest can therefore be much smaller, as confirmed by the trial results.

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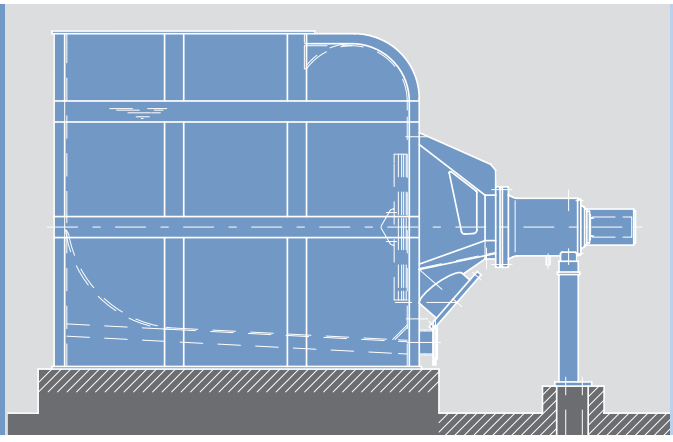

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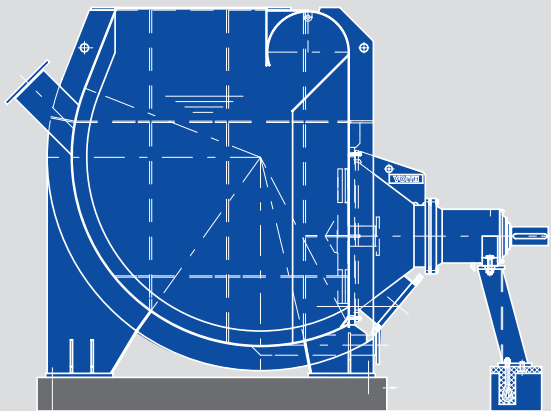

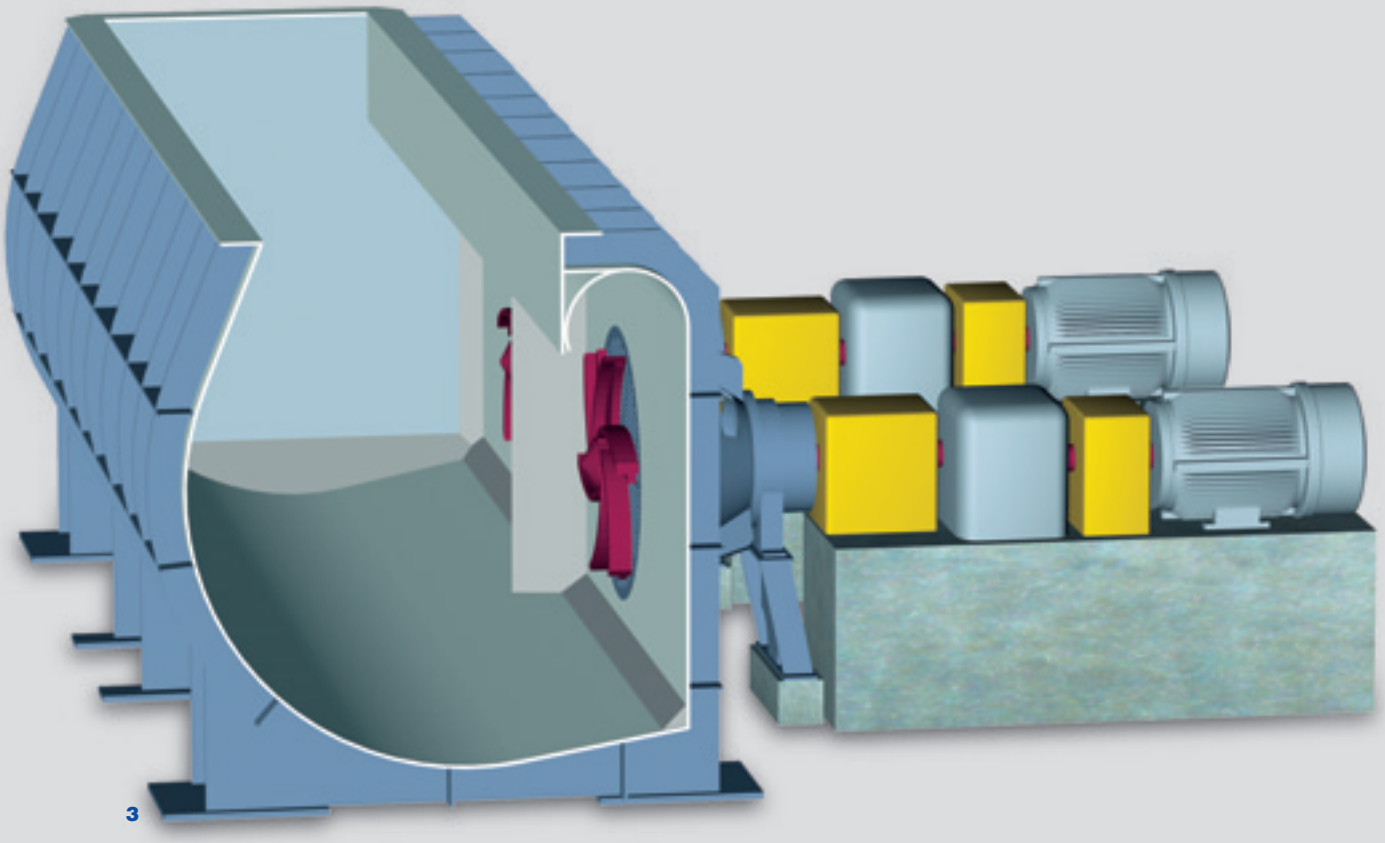

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The smaller chest volume and the optimized flow provided by its new geometry, as shown in Fig. 3, has meant pulping intensity is up to 40 % higher for the same installed power. The result is a significantly better suspension movement, which in turn improves sheet draw-in and pulping intensity.

A benchmarking comparison with popular rotor geometries was also carried out during the development trials. The findings revealed a better pulping efficiency with the AK rotor compared with all other rotors investigated. Since the high shear potential of the AK rotor is fully exploited due to the improved stock movement, the decision was made to continue using it in future.

The mill trials clearly showed, however, that optimum operation also depends on correct functioning of the showers and control system.

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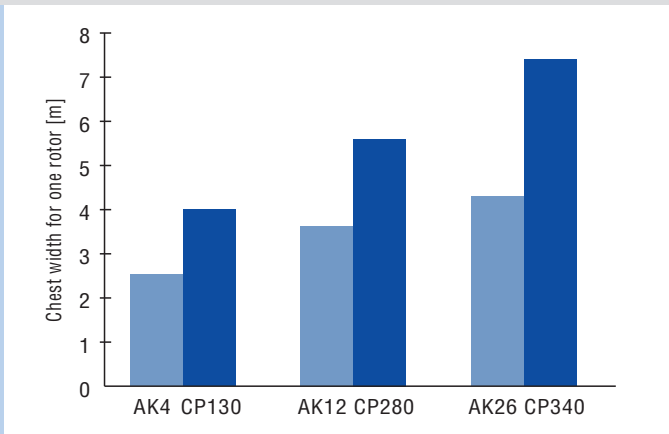

In summary, the new CP CompactPulpers offer significant improvements:

- Savings in space thanks to the slim and compact pulper design
- Up to 40% more pulper working width for the same installed power (Fig. 4)
- Maximum chest width 12 m
- More intensive pulping thanks to faster circulation and better rotor contact
- Reduced splashing and better draw-in by using an optimized deflector design
- Optimal exploitation of rotor performance potential and less air ingress into the broke system thanks to good submersion of the rotor.

Like every new Voith product, the first CompactPulper was intensively monitored after commissioning. The assumptions were shown to be correct and all 25 CompactPulpers so far installed are operating faultlessly. The good order intake since market launch of the CompactPulper reflects customer confidence in this technology.

1

Rejects and residue disposal from recycled fiber plants – Europe as the pioneer in rejects handling systems

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Up to now not everyone realizes that the costs for rejects disposal can be up to 5 % of the earnings from paper production. Until now, return on investment (ROI) has been the only decisive criterion for capital investments in rejects handling systems. This will change considerably once the legislation demanding much more stricter standards for rejects disposal in Germany (from 01.06.2005 onwards) and Europe comes into force.

"I don't care about rejects, just get rid of them!" Not too long ago rejects handling was very simple: collection, basic dewatering, loading onto trucks, and transport to a nearby landfill. The costs were low, not much work was involved and the topic was of minor importance in planning and operating a paper mill.

Basically, the main objective has always been to get rid of rejects before they cause problems. As long as there were plenty of options for disposal, this objective was easy.

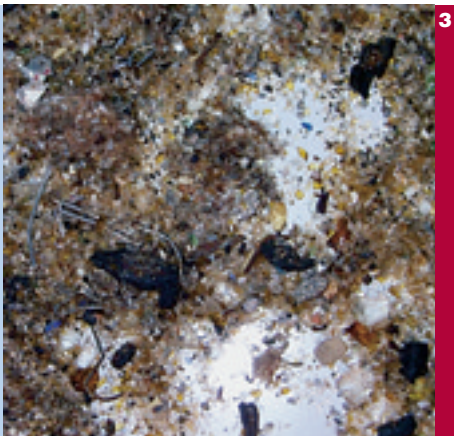
And now a few figures: a 1000 t/24 h corrugating medium mill using 100 % recycled fiber can generate more than 50 t of rejects per day (Fig. 1). Deinking plants can exceed this amount many times over. Landfill costs vary greatly from one region to another. In Germany, for instance, they can range from 60 to 200 € per ton. With a recycled fiber consumption in Germany of about 11 million tons per year, 500,000 tons of rejects need to be disposed of every year.

But what exactly does "disposal" mean today? Taking rejects directly to the landfill will no longer be possible in Europe in the near future. In Germany, for instance, from 01.06.2005 onwards landfill will only be permitted for material with less

Fig. 1: *Automatic container loading station.*

Fig. 2: *Lightweight coarse rejects after compacting.*

Fig. 3: *Heavyweight fine rejects from the cleaners.*



than 5% organic content. In Austria this ruling has been effective since 01.01. 2004.

The "export" of rejects for disposal in countries with lower standards involves tremendous transport costs, and is only possible to a very small extent because of regulations on waste shipment. As a result, rejects from recycled fiber operations must generally be incinerated and only the combustion residues can be landfilled.

What are the consequences of incineration? The rejects have to meet certain quality requirements. What at first seems to be a paradox is going to become a major design criterion for recycled fiber plants:

- Inspection of the incoming raw material will become more and more important
- With baled material the dewiring efficiency will influence the required technology for rejects handling
- Removal of incombustible, inert material such as metal, glass or sand from the rejects is essential
- The metal fraction should be as clean as possible to facilitate its recycling, instead of disposal
- Rejects dry content has a decisive influence on suitability for incineration and on the transport costs involved.

The main objective is still to get rid of the rejects. Immediately, wherever and whenever they arise.

What exactly are rejects composed of? First of all, there is a basic difference between rejects and sludge. Sludge is homogeneous, like for instance the residue from deinking cells, from micro-flotation or from primary clarification.

Rejects, however are not homogeneous. They consist of coarse and fine rejects. Coarse rejects are found in pulping and coarse screening, fine rejects in the subsequent process stages of cleaning and fine screening as well as in the approach flow system.

Heavy coarse rejects are all kinds of metal of different shapes and sizes, stones, wet strength waste paper that has not disintegrated, wires etc.

Light coarse rejects **(Fig. 2)** consist of bits of plastic, plastic foils, CDs, etc.

The composition of the coarse rejects depends mainly on the type of pulping system: here one can distinguish between systems that discharge heavy- and lightweight coarse rejects separately (e.g. TwinPulp System) or systems where these are removed together. With the increasing use of drum pulpers the focus is more and more on the latter option.

With fine rejects one distinguishes between light- and heavyweight, too.

Heavy fine rejects mainly consist of sand, glass, staples and other metallic office waste as removed by HD and LD cleaners, as well as via the heavy junk traps of combined screening and cleaning equipment **(Fig. 3)**.

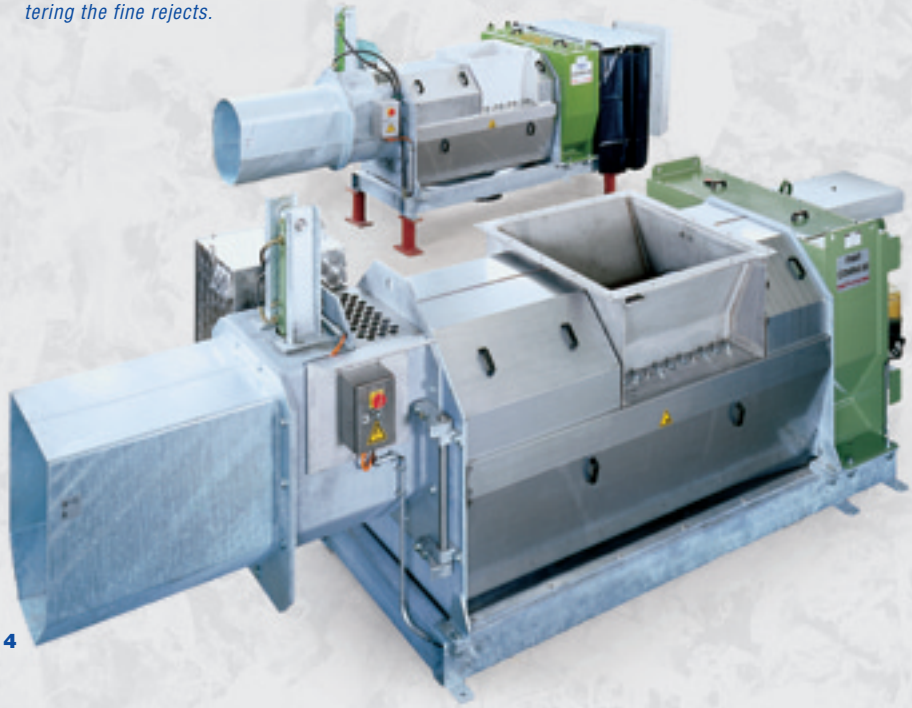
Light fine rejects from slot screening or lightweight cleaning contain fiber debris, stickies, wax, fillers, etc.

And now back to the main concern: how can we ensure that all these types of rejects are got rid of at all times and in all places?

To answer this question we have to go back and look at the available options for disposal. Here we again come face to face with the increasingly exacting standards set by legislation and with the requirements for rejects quality.

Fig. 4: *Reject compactors of the Compax series.*

Fig. 5: *Two Sediphant machines installed in the new paper mill Palm in Wörth, Germany for dewatering the fine rejects.*



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Those rejects suitable for incineration must be discharged with the highest possible dry content, i.e. with the highest possible thermal value (>11 MJ). The size of the rejects must also suit the available incineration technology. Additional drying may be necessary. The percentage of organic contaminants in the incombustible, inert material must be reduced to a minimum to enable its disposal.

Reusable material such as metal has to be removed as clean as possible to make it acceptable for recycling.

Designing a rejects handling system must therefore reflect these disposal objectives as well as the composition of the rejects and where they are removed in the stock preparation process.

The equipment used in the rejects handling system is, of course, the key to success. Long life and adaptability to the individual task, minimum maintenance for ensuring maximum runnability are the basic pre-conditions, as offered, for example, by the **Compax** series of reject compactors **(Fig. 4)**. These have been successfully proven over many years and in several hundreds of installations worldwide.

The **Sediphant** **(Fig. 5 and 6)**, is another highlight among the many rejects handling machines available from meri. The machine is a unique, patented combination of sediment separator and thickener, ideally suited to separate out light and heavy fine rejects containing fibers and dewater them. The incombustible heavy particles fraction is discharged with a low moisture content **(Fig. 7)** and the lightweight rejects are pre-dewatered and can be incinerated after further dewatering **(Fig. 8)**. The filtrate has a uniform quality.

The installation example at the end of this article **(Fig. 11)** illustrates how an overall rejects handling concept with intelligent interplay of the conveyors and their reversing and bypass functions, as well as smart layout, are all important factors for runnability and reliable operation.

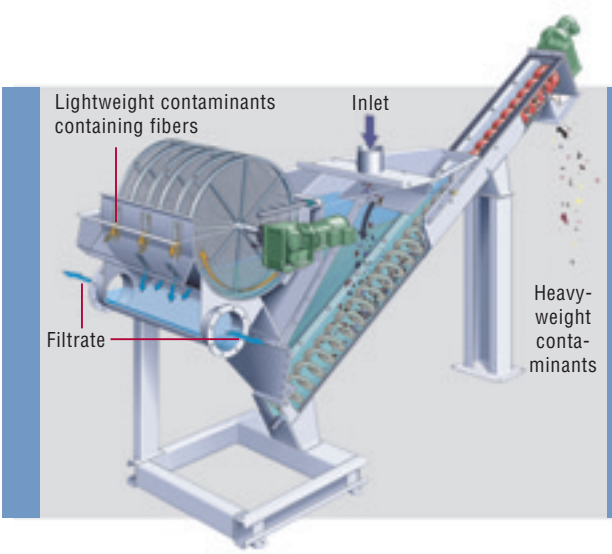
This and numerous other installations clearly show how the handling of rejects has developed within only a few years into a complex task which can no longer be accomplished by just installing individual machines. Detailed systems know-how is required here.

Fig. 6: *3D function layout for the Sediphant.*

Fig. 7: *Heavyweight fraction after removal and dewatering with the Sediphant.*

Fig. 8: *Lightweight fraction from the Sediphant after further dewatering.*

Fig. 9: *Example of disposal costs as a percentage of the earnings from paper production for various paper grades.*



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	Market price per ton paper (typical values)	Total non-paper production losses (typical values)	Amount sent to landfill per ton paper at 60% dry content	Landfill costs per ton paper at 100 Euro/t	Disposal costs as a percentage of earnings
Newsprint	500 Euro	18 %	300 kg	30 Euro	6.0 %
Corrugating medium	300 Euro	5 %	83 kg	8 Euro	2.7 %
Graphic papers	1000 Euro	25 %	416 kg	42 Euro	4.2 %

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This is where meri Entsorgungstechnik GmbH, a joint venture company between Voith Paper Fiber Systems and meri Anlagentechnik, can help, using experience gathered from 30 complex rejects handling systems in operation, and more than 600 machines installed in the paper industry. Meri provides the papermaker with tailor-made subsystems as well as special machine technology.

It should not be forgotten that the filtrates from the rejects/sewer zone represent an important interface with the water system of the overall plant and therefore they have to be taken into consideration for a complete overall view.

Standards set by legislation are increasingly influencing the design of rejects handling systems. Since specific disposal costs nowadays can amount to around 5 % of earnings from paper production **(Fig. 9)**, investment in an optimized rejects handling system should be viewed with great interest from an ROI point of view. The potential savings from an increased rejects dry content alone can be tremendous **(Fig. 10)**.

When designing new plants, the following should be considered:

- Include rejects handling in the overall concept as early in the design stage as possible
- Define present and future options for rejects disposal
- Allow for future expansion of the rejects handling system from the outset
- Integrate metal separation and rejects size reduction
- Allow good accessibility for operation and maintenance
- Regard the rejects handling as an integrated system.

Example (Fig. 11)

This recent example describes a state-of-the-art rejects handling system in a newsprint production line where a drum pulper is installed. The objective was to prepare the rejects for incineration in a given particle size, and to minimize the incombustible content. The concept must ensure continuous pulper operation even during shutdowns in the rejects system or when maintenance work is required here.

Fig. 10: *Relationship between disposal costs per ton paper and dry content of the rejects going to landfill.*
- *Graphic papers*
- *Newsprint*
- *Corrugating medium*

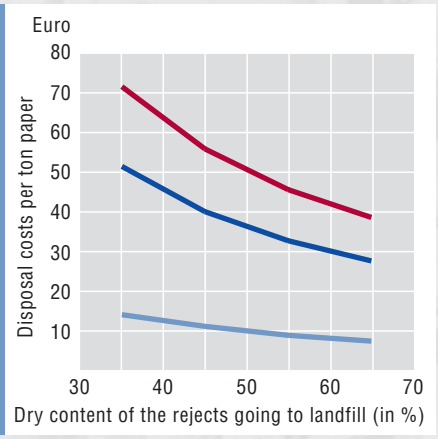
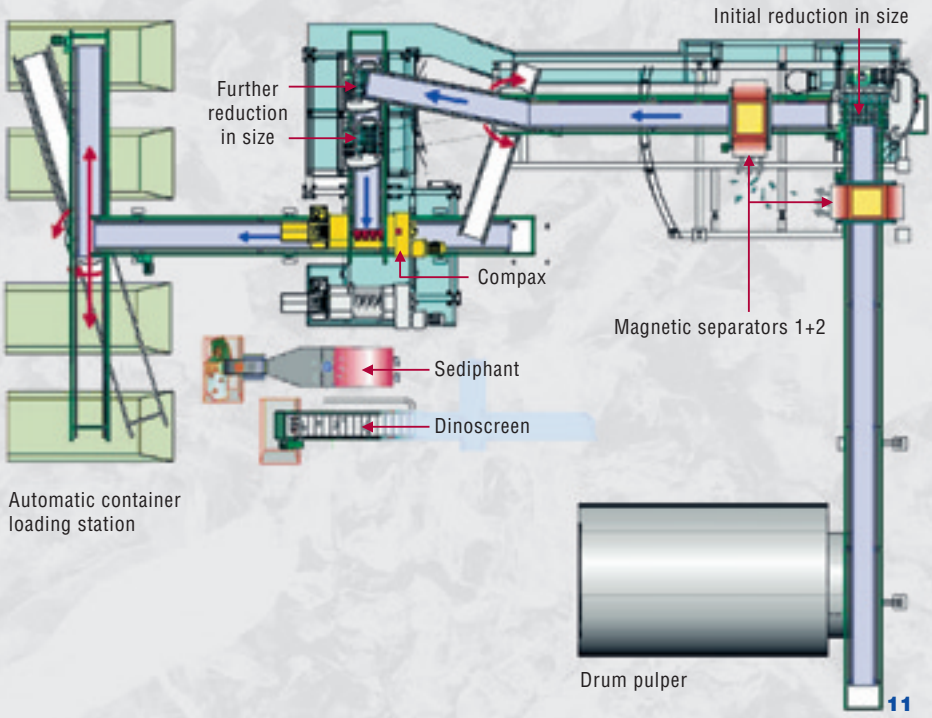


Fig. 11: *Example of a complete rejects handling system for preparing the rejects for incineration.*



A **Dinoscreen** is used for removing coarse contaminants from the sewer channel, dumping them into a separate container. Rejects from HD and LD cleaning and from slot screening are dewatered in a **Sediphant**. The heavyweight material from the **Sediphant** is also discharged into a separate container.

The complete rejects from the drum pulper are collected on a conveyor. A metal detector removes large pieces of metal, which are dumped into a container by reversing the conveyor direction. A magnetic separator, located above the conveyor, removes ferrous metal, also dumping it into a container.

The rejects are then shredded into small pieces in a **Lion** shredder. Rails allow the shredder to be moved into a maintenance position without interrupting operation of the rejects handling system. A second magnetic separator then removes any remaining ferrous metal from the conveyor feeding the post-shredding stage. Here, two **Lion** shredders operate one above the other and at 90° to each other. These reduce the rejects to the required size. The feed conveyor can be swung so that the post-shredding and the subsequent compactor stages can be bypassed.

In normal operation the shredded material is dewatered with a **Compax** reject compactor, achieving a dry content of more than 60 %. After compacting, the rejects are distributed automatically into four containers. A movable conveyor equipped with sensors can fill every container from several positions so that all four container capacities are used to the full. The rejects are now suitably ready for incineration.

Up to now, most of the examples of complex rejects handling systems are in Europe, but in other countries there is an increasing need to pay more attention to rejects handling. This is motivated either by the need to reduce operating personnel or to simplify disposal and make it more cost efficient.

1

The success story of Shandong Huatai Paper and Voith Paper keeps on rolling

The business relationship between Huatai Paper and Voith Paper started nine years ago when Huatai began to negotiate and purchase their High Tech components for the new PM 1 of their new paper mill complex.

This relationship was extended into a partnership, when the former Haindl Schongau paper mill decided to replace their PM 9 with a new modern One Platform Concept machine from Voith.

As PM 9 had always been in good condition and was producing top quality newsprint paper at very high efficiency, the decision was made to sell this machine.

PM 9 was completely dismantled, boxed and shipped to China to be reinstalled for its revival at Shandong Huatai Paper mill site in Dawang.

A new building was erected to give home to this machine and in short time it was possible to start it back up again.

With a face lift, as far as the optical appearance is concerned, and minor new units, the machine was completed. The dismantling as well as the erection, commissioning and start up was performed by Huatai Paper together with Voith Paper.

After a picture-book push button start up good quality newsprint paper could be produced from the first day.

With an impressive efficiency of up to 97% including an average of 1.5 sheet

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Li Jian Hua

President and speaker of the board of the Shandong Huatai group states

"Voith Paper offers the most modern technology as well as a first class service to their customers. Since our long and close co-operation we developed a deep friendship between both partners Voith and Huatai. The very successful commissioning of the 200,000 tons per year newsprint line from Voith elevated Huatai Paper into the position of the number one newsprint producer in China with a very good reputation."

breaks a day and an average operating speed of 1,180 m/min, newsprint paper based on DIP is produced now for the Chinese market at a rate of 150,000 tons per year.

Within very short time, the paper from PM 9 was established in the market as a superior quality brand.

This success as well as the fast ROI put Huatai Paper Group in the position to proceed with yet another project. The Huatai PM 10.

Huatai PM 10

As the newsprint project in China with the most modern technology, it was completed, producing the first consecutive jumbo rolls without a break on 28 th July 2003, 20 months after signing of the contract. Only with the philosophy of their close partnership Shandong Huatai Paper and Voith Paper made this green field mill project a success. To date production has proceeded well and the development of a superior quality product has been confirmed.

On a site covering more than six square kilometres, this turnkey project grew in an amazingly short time. The impressive scale of this plant indicates the foresight and ambition of the mill to establish an operation comprising leading edge technology to manufacture a high quality product.

A well equipped Voith Paper Service Center have been established in the neighbourhood to support the total operation.

Fig. 1: *Huatai Group.*

Fig. 2: *Huatai PM 10.*

Fig. 3: *Ecosoft calender.*

Technical data PM 10

Max. operation (layout) speed	1,600 m/min
Mechanical design speed	1,800 m/min
Wire width	7,100 mm
Trim width max. on reel	6,420 mm
Jumbo roll diameter	3,500 mm
Output	807 t/d
Winder speed up to	2,500 m/min
Roll diameter at winder up to	3,500 mm

Future plans include the addition of further paper machines. All necessary infrastructure is already in place.

After an intensive planning phase, Voith Paper was awarded the order end of November 2001 for one complete production line for newsprint with the reference grade of 48.8 g/m^2. The Voith Paper scope of supply also covered the complete deinking plant, stock and chemical preparation as well as automation, the finishing equipment with slitter winders and the packing and roll transportation line.

A trouble free fabrication and supply of all components was assured by comprehensive control measures based on the approved Voith's Quality Management according to DIN ISO 9001 and also following Huatai Mill's standards. All quality controls, therefore, were based on predetermined criteria and certification plans, both with respect to sub suppliers and own fabrication.

In order to achieve effective project progress, several liaison and coordination meetings were held on a mutual determined basis. The time available from receipt of order to operation of the paper machine was extremely limited and, therefore, required big efforts from all parties involved.

Professional organisation and excellent cooperation between Huatai and Voith Paper during the entire period were the basis for the final success.

Huatai Paper and Voith Paper were put to the test by an extremely tight manufacturing and pre-assembly schedule for the paper machine including all components and the civil work. A large-scale logistic coordination of all suppliers had to be mastered within a short time. Site erection was done by Chinese contractors, supported by Voith Paper supervisors. The entire erection time of the equipment was only 5 month, which is exemplary and unique and is the result of good co-ordination and co-operation between Huatai and Voith Paper.

4

The basis for the successful erection and commissioning was a thorough scheduling of all activities together with Shandong Huatai Paper, as well as the agreement on certain milestones and preconditions. A master plan was always broken down in weekly and daily schedules for all necessary activities. Progress was openly supervised – thus a systematic and planned work was the result.

Based on the new Voith Paper Project-, Erection- and Commissioning Management System, the erection personnel completed the functional checks together with the commissioning crew. As in all other Voith Paper start ups, open and honest team work with Huatai engineers was the rule for the efficient work.

Especially the training of the Huatai Paper operators was performed very consciously. Individual groups were trained in class room sessions in Heidenheim, Krefeld and Ravensburg/Germany. This classroom training was followed by a practical training in a papermill with a similar paper machine. Huatai Paper's stock preparation operators were trained on their new equipment in Huatai.

All the training in Germany as well as the project management, erection and commissioning period were marked by the common goal of Huatai Paper group and Voith Paper:

"Paper on the reel as fast as possible and ramping up the production as fast as possible, making a good quality paper – quality tons on reel."

This common goal was achieved since signing the contract to "quality tons on reel" in only 20 month.

Voith Paper's "One Platform Concept" is a proven guarantee for fast start ups, short times to reach the maximum operating speed and guaranteed paper quality and thus a quick return on investment.

The PM 10 started up on July 28 at a speed of 1,408 m/min, producing eight consecutive Jumbo rolls without any web break. In early August 2003 an output of more than 650 tons per day at a speed of 1,520 to 1,555 m/min had been reached, producing first class newsprint. Even 1,655 m/min, which is far above the lay out production speed, have been run for a few hours in order to check the limits of the line. The production line was optimized in the following weeks to operate at this top speed on an average basis, producing the designed layout tonnage day in and day out.

The efficiency figures are remarkably high and are close to its neighbouring paper machine No. 9.

Huatai Paper manufacturing plant machine components

- Complete DIP plant from drum pulper to the finished stock storage tower
- ModuleJet headbox
- DuoFormer TQv
- Tandem NipcoFlex press

5

6

Fig. 4: *Huatai PM 10 final section.*

Fig. 5: *VariFlex L winder.*

Fig. 6: *The start-up team.*

Fig. 7: *Thune disc filter (on the left) and EcoCell post-flotation deinking (on the right).*

Fig. 8: *The TwinDrum drum pulping system (drum pulper on the left, drum screen on the right).*

- TopDuoRun dryer section, 7 dryer groups (32 cylinders)
- EcoSoft Delta calender
- Sirius reel
- Dryer hood
- Hydraulics and pneumatics
- Control and Instrumentation and automation
- Oil lubrication system
- Sets of spare parts
- Erection supervision
- Commissioning and training
- 2 two-drum winders VariFlex with parent roll storage
- Packing and roll transportation system
- Tail threading

A VTT Turbo conveyor, installed with a Flip Tray transfer device, provided the threading solution at the Huatai mill. The installed Flip Tray picks the tail up from dryer 32 and places the tail on to the conveyor. The VTT Turbo then transfers the tail into the Ecosoft calender rope nip. The VTT Turbo utilizes an internal air turbine, driven by compressed air, to create a stable vacuum and helps to optimize the threading process throughout the machine.

- Fabrics

With Voith Fabrics Quantum II AR running on the 1st dryer section and Quantum II on the remaining sections, the Huatai PM 10 has seen improved fabric life. Due to the success on the dryer section, Voith Fabrics has received repeat orders and provided the customer with quick delivery times and superior service. Voith Fabrics' forming fabrics have also performed well on the Huatai PM 9.

The recovered fiber system

Fiber Systems was responsible for the complete recovered fiber system for 500 t/24 h deinked finished stock, from the drum pulper charging system, right through to thickening, storage, waste water handling, chemicals treatment and broke handling.

The drum pulper charging system was supplied by group member B+G and is designed to handle a mixture of 70% AONP and 30% AOMG comprising up to 100% loose paper and bales. The equipment included the complete conveyor plant with bale breaker.

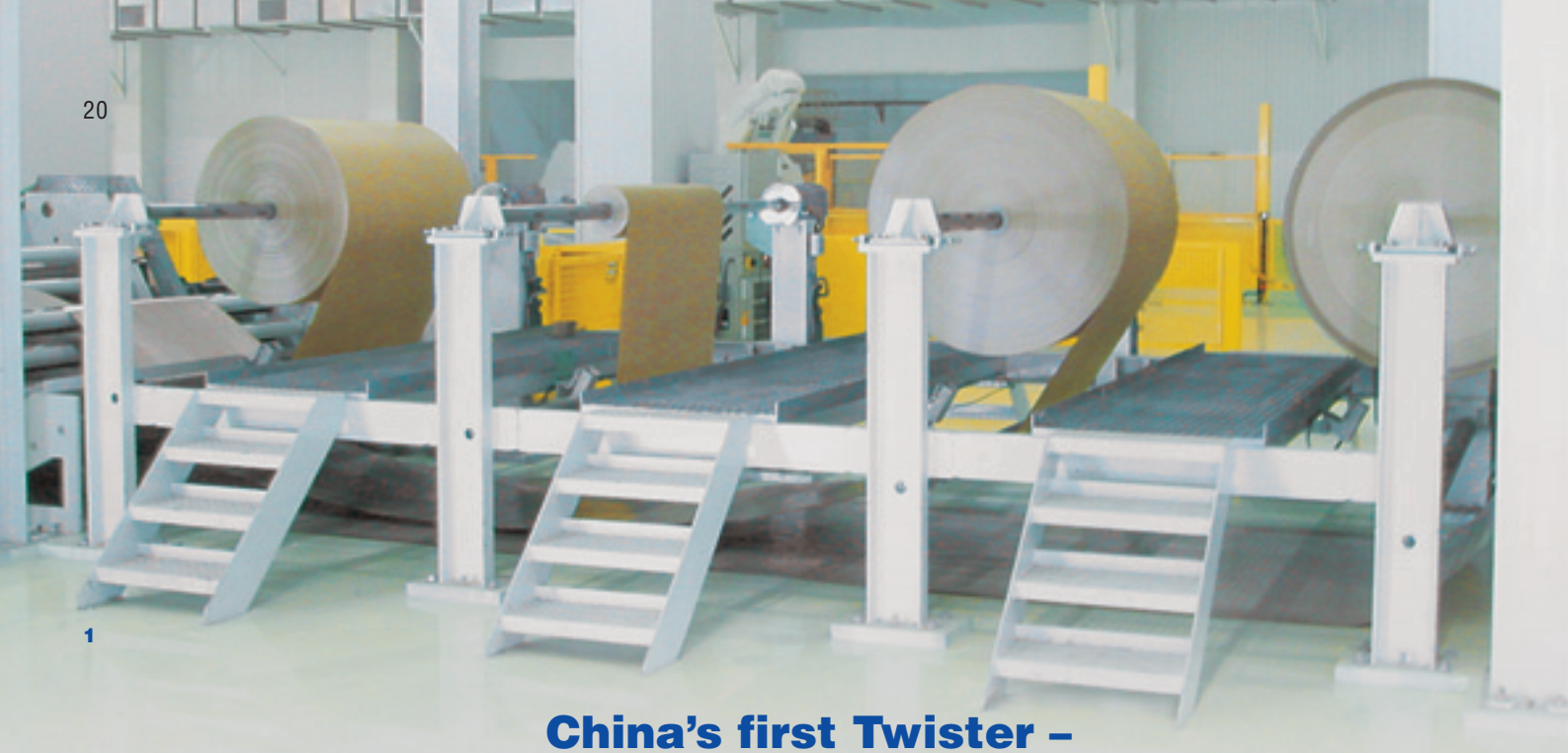
The TwinDrum drum pulper consists of two separately rotating drum bodies (drum pulper with integrated displacement core and drum screen) **(Fig. 8)**. TwinDrum's pulping and screening results are clearly superior to other pulping systems so far on the market as regards deflaking, gentle fiber treatment and avoidance of contaminant size reduction.

The pulped stock passes from the TwinDrum system to two-stage high consistency cleaning (HiPro system) for efficient removal of sand and heavy particles. A two-stage forward-flow MC hole screening system then follows, using a MultiSorter (1.4 mm holes) in the first and a Combisorter in the second stage.

MC hole screening is followed by three-stage IC cleaning with EcoMizer technology. The cleaned stock is then fed to EcoCell flotation **(Fig. 7, right)** consisting of five primary and two secondary cells for pre-flotation and four primary and one secondary cell for post-flotation.

High performance 4-stage LC slot screening with 0.15 mm C-bar screen baskets follows the pre-flotation cells. This is succeeded by thickening I and disperging using a Thune disc filter **(Fig. 7 left)**, Thune screw press and a disc-type disperger. Next comes HC oxidative peroxide bleaching, post-flotation, thickening II, reductive hydrosulfite bleaching and, finally, storage of the finished stock.

Apart from the above mentioned process equipment, Fiber Systems was additionally responsible for the complete chemicals preparation of the DIP plant, basic process and control engineering as well as for erection supervision. Plant commissioning was undertaken in close teamwork between Voith and Huatai.



1

China's first Twister – automated paper roll wrapping par excellence

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For the new PM 10 at Huatai Paper, an additional requirement by the customer was state-of-the-art roll wrapping.

The new wrapping line had to meet the following demands:

- Capacity:
  more than 120 rolls per hour.
- Roll width range:
  600 mm to 2,200 mm.
- Grade and format changes:
  on a recurring basis.

In view of the high capacity and fairly consistent roll parameters, with unchanging widths for lengthy time periods, we decided to replace the travelling paper dispenser normally used for spiral winding on the Twister with a compact stationary dispenser (Fig. 1).

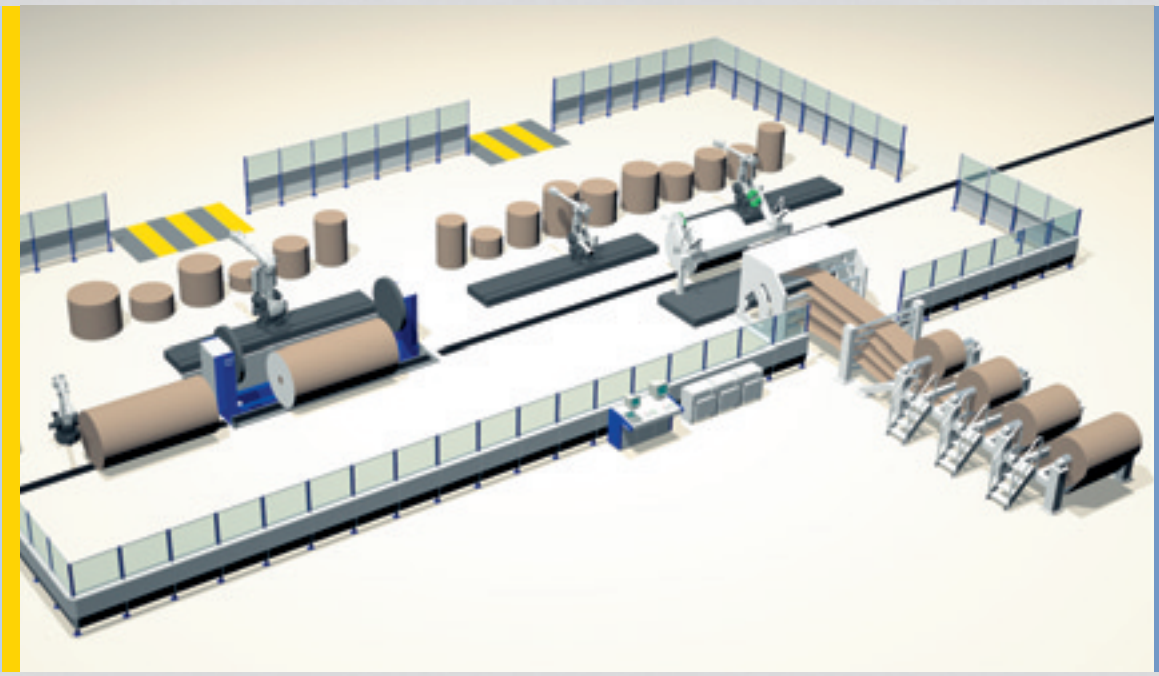

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Fig. 1: *Wrapping paper dispenser.*

Fig. 2: *3-D layout graphic of Huatai.*

Fig. 3: *3-D layout graphic of Twister 2-Line.*

Fig. 4: *Inner header disk robot.*

Fig. 5: *Outer header disk robot.*

This dispenser comprises a feeding system with integrated gluer/cutter and four wrapping paper rolls. It enables roll wrapping in a single operation including end fold-over and gluing. Only with respect to the stationary dispenser, the Huatai PM 10 roll wrapping machine layout differs from the automated Twister 2-Line installations at e.g. Steinbeis-Temming and SCA Laakirchen, and soon at Leipa. This is clearly shown in the 3-D layout in **Figs. 2 and 3**.

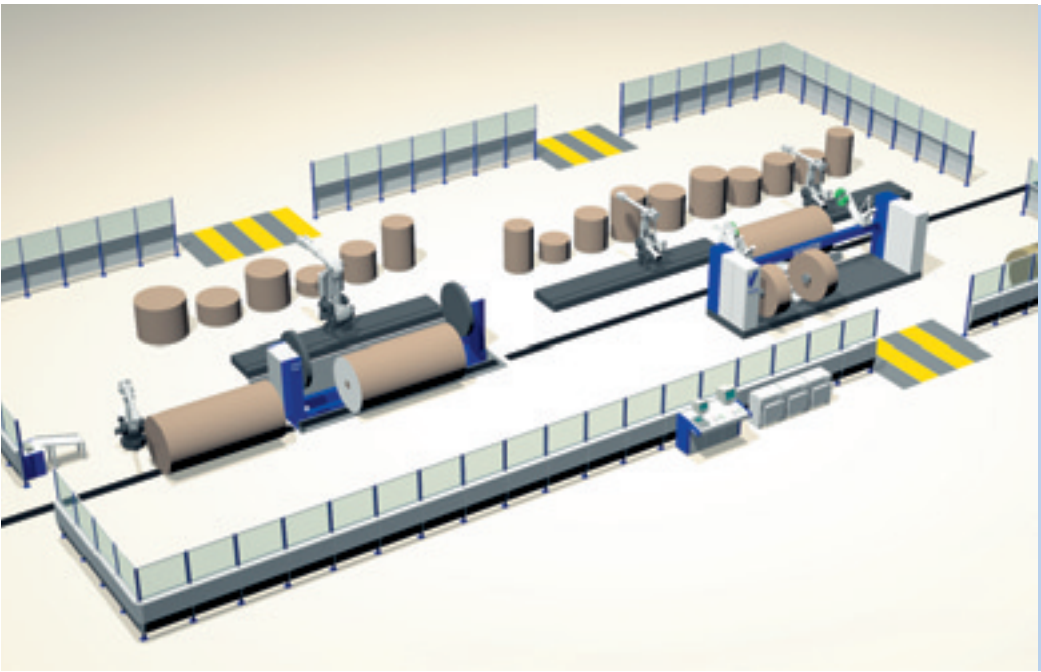
At Huatai the automated handling system components are identical to the robots so far used in all Twisters for handling the inner and outer header disks and labels. Two robots in the Huatai wrapping line take inner disks from their respective stacks. Then one robot places the disk on the left face of the roll and the other on the right face. Despite the fast operating cycle, this always ensures enough time for cleanly lifting the header disks off the stacks **(Fig. 4)**.

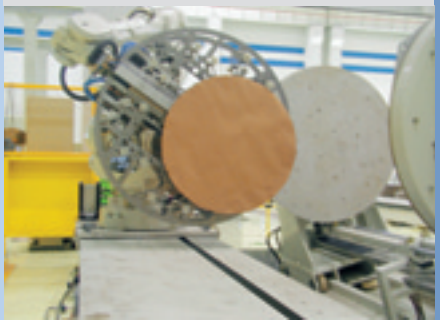
The double gripper of the robots for the outer header disks has a special adjusting mechanism to fit the different diameters and reliably separate the disks, which are usually serrated. An additional advantage of this gripper design is that even the largest disks are supported over their entire surface area on the header press, thus making bent edges a thing of the past **(Fig. 5)**.

These 6-axis industrial robots are mounted on a traverse, which gives them seven axes of motion. As a result, the disk stack can be lined up in front of the robots instead of around them in a semicircle. Not only does this look better; but above all it greatly simplifies the delivery of new disk stacks.

The robots operate as completely autonomous units, thus guaranteeing high reliability of the roll wrapping line. They fit the header disks and labels with the greatest precision – roll by roll – to ensure perfect wrapping.

Another interesting feature of these Voith wrapping machines is the cross-line roll





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transport system. Since 1996 Voith has used high-speed plate type conveyors instead of the walking beam formerly used, which, due to its complexity, was prone to breakdowns, wear and tear. Another important argument for using plate type conveyors is that they enable precise roll positioning in front of each workstation for winding, pressing, and labelling. This ensures high wrapping quality even with the fastest operating cycles **(Fig. 6)**.

As shown by the Huatai PM 10 roll wrapping line, Voith's One Platform Concept developed for paper machines does not end at the Sirius or a standard reel, but also includes the entire roll handling zone. Moreover, by changing only one module, in this case the dispenser station with feeding system, the Twister concept has been enriched with a new option. This ideally meets specialized customer needs while benefiting from the experience gained on numerous Twister installations.

After mainly dealing with the mechanical aspects so far, it is time to take a look at the control system. Normally, the wrapping line is connected to the mill computer, which keeps control of each roll from beginning to end via its wrapping and shipping data. An automation module, therefore, had to be developed for this specific application. This comprises the Rolltronic, a powerful visualization and communications software module individually adjustable to communicate with any kind of mill computer system. However, the special possibilities in China as mentioned above enable operation of the roll transport and wrapping line without a mill computer.

For Huatai the Rolltronic software was extended with a special module to take over the tasks of a mill computer. This module generates, manages and prints out the roll barcodes, and to this purpose is directly interfaced to the two Voith VariFlex winders for automatically uploading the cut roll dimensions. After weighing, each roll is then labelled with all relevant data after wrapping.

The Rolltronic module saves all the roll data, both before and after wrapping, in respective databases and prints out the shift log and production records. In the same way as the mechanical plant-customizing, adjustment to specific customer needs merely required a change of module in a very well-proven software.

Thanks to systematic application of the Voith One Platform concept to the Huatai PM 10 Twister installation, and smooth commissioning teamwork between the customer and Voith, the maximum capacity of more than 120 rolls per hour was already attained at startup. In fact the normal 2 or 3-stage performance optimization phase was not necessary at all. We are therefore particularly proud of the praise we received from **Tian Zhiding**, Vice General Manager Huatai, during the official acceptance: *"This fully automated roll wrapping line meets all our requirements. It is an excellent reference for Voith."*

The rolls are wrapped so well that they arrive at the printers in perfect condition – obviously – even after the toughest journey **(Fig. 7)**.

PS: In Huatai I got the impression that the robots felt very happy with their professional treatment by the friendly operators!

Fig. 6: *Wrapped rolls.*

Fig. 7: *Let's roll!*

6

Trade fair and more...

Voith Paper demonstrates its technological competence and close relationship with customers

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China Paper Exhibition 2003 5 to 7 November in Peking

The China Paper Exhibition is the most important trade fair for the paper industry in Asia and has been held every two years since 1987. With a representative presence at the fair this year, too, Voith Paper has again succeeded in demonstrating its technological competence and in making important contacts with customers.

Parallel to the fair, Voith Paper organized a customer conference and a press conference to present there range of services to a broad public in the growth marketplace of China.

Over 30 journalists from the international technical press, the local daily newspaper and economic journal press as well as from the local television station accepted Voith Paper's invitation to the press conference.

Dr. Hans-Peter Sollinger, member of the Management Board, underlined the growing importance of the Chinese market for all Group divisions. Voith Paper took this trend into account at an early stage by considerably increasing the number of employees in China over the past few years and by expanding the local production and service locations.

Numerous questions from the journalists concerning the One Platform Concept showed the active interest in the strategies of Voith Paper for the Chinese marketplace.

At the customer conference, Voith Paper demonstrated its process competence for graphic papers, board and packaging papers as well as specialty papers. Since 1997, Voith Paper has been awarded 17 orders in China for new, state-of-the-art paper machines and has, therefore, been able to establish itself successfully in China.

Over 250 participants listened to the technical papers with great interest. They were presented in Chinese by experts from our office in Shanghai.

At the evening banquet, to which 150 major customers and government representatives were invited, they enjoyed not only culinary delicacies of the Chinese cuisine, but also musical highlights of popular Chinese music.

Kimberly PM 96 – position for long-term competitiveness

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Stora Enso North America is the leading manufacturer of coated and supercalendered printing papers. In line with the company's worldwide strategy of keeping its position as a leading producer in the paper industry, it was decided to go ahead with the rebuild of PM 96 at its facility in Kimberly, WI, USA. The rebuild would significantly improve Stora Enso's position for long-term competitiveness in the North American market place.

The original PM 96 rebuild project at Kimberly Mill was suspended in 2000 during the acquisition of Consolidated Papers, Inc., Wisconsin Rapids, WI, by Stora Enso North America (SENA).

The major equipment for the machine rebuild had already been purchased from Voith Paper, but had not been installed.

In the fall of 2002, with SENA's new strategy in place, Voith was given the go-ahead to continue the rebuild project.

Voith would also supply start-up and erection services, training and spares for the project.

The target was to directly improve sheet quality and would include a DuoFormer D twin wire top former, which would be installed on the 242-inch wide fourdrinier machine. The existing headbox would be rebuilt, and two new VPS 20 pressure screens would be added in the approach flow, improving screening capacity and fiber yield.

When faced with the task of rebuilding the No. 96 paper machine, the mill's project team faced a number of difficult choices in order to keep within very tight budget constraints.

The original Dominion paper machine, installed in 1979, had a Voith W-type headbox. A decision had to be made whether to rebuild the original headbox or purchase a new one. After a thorough structural analysis, using a finite element model, it was determined that a special reinforcing would have to be installed for the headbox to meet the new design conditions.

The choice was made to rebuild the existing headbox as originally planned. This rebuild would incorporate the latest in Profilmatic M dilution control technology.

The headbox would receive new state-of-the-art actuators as well as a new slice lip and general modification to incorporate the latest in ModuleJet technology.

Reconditioning of the headbox would be done at Voith Paper in Appleton, Wisconsin during the shutdown to rebuild PM 96.

When the headbox was disassembled and cleaned, shortly after its arrival at Voith's facility, unexpected rework of the mounting plates was needed. The machine shop at Voith Paper's Appleton facility was fully qualified to handle these unexpected obstacles and repairs were made without significantly affecting the overall schedule.

The rebuilt headbox and the new Voith DuoFormer D were installed on what could be considered a model shutdown. At start-up, salable production was quickly achieved and the important gains in paper quality, expected in CD basis weight profile, fiber angle and formation, quickly attained.

The Appleton facility is a valuable resource for Voith Paper's customers in North America. The close co-operation between the SENA Kimberly mill and Voith Paper personnel, in using this facility to its potential, resulted in a cost effective project of which everyone can be proud.

With the rebuild completed on May 10th 2003, the PM 96 production line is now producing coated paper at quality levels exceeding the Stora Enso planned targets.

Asko Hyttinen

Sr. Vice President, Strategy, Investment and M&A

"The rebuild of the Kimberly PM 96 is an integral part of SENA's Profit Enhancement Program launched in 2002 which consists of machine closures, product transfers, workforce reductions, and significant capital improvements totaling 250 Mio US$. Initial performance of the rebuild production line shows us that our targets of quality and productivity will be met. During this project, the close cooperation together with Voith helped us meet our goals."

Sean Wallace

Manager PM 96 line and rebuild project manager

"As a result of the rebuild, we have significantly improved our quality, further enhancing our ability to be our customers' first choice."

NipcoFlex and TissueFlex –
Shoe press technology for the dewatering of all paper grades

Dr. Jens Müller
Paper Machines Graphic
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The important technological and economic advantages have expanded the use of shoe press technology to the dewatering of all paper products from pulp to tissue. Whereas the development of NipcoFlex technology began in packaging paper machines 20 years ago, this technology can today be found in virtually all applications for the mechanical dewatering of the paper web in new and modernized production systems. The portfolio offers an economic solution for increasing productivity and efficiency for any requirement, whether a rebuild or a new machine. The advantages of shoe press technology are now also utilized in calendering in the paper industry.

Application range

Since the introduction of closed shoe presses in the paper industry in 1984, over 400 shoe presses have been put into operation. Of these, Voith has received orders for 280 systems **(Fig. 1)**. The size of these systems is between 2 m to almost 11 m paper width in the press nip. Equally large is the range of the speeds that have been implemented. These extend from 50 m/min in pulp dewatering up to 2,000 m/min on tissue machines.

Graphic paper

The first shoe press for graphic papers was put into operation in 1995. The benefits of shoe press technology have led to the fact that today more than 100 NipcoFlex Presses are used for the production of these grades. In contrast to a conventional press nip, the shoe press offers the possibility of varying the pressure in the press nip. The pressure profiles are individually adapted to the technological requirements of the production process concerned and the pressure shoes are manufactured accordingly. The pressure profile is designed for gentle dewatering for a uniform sheet structure with as high a bulk and dryness as possible. In the NipcoFlex Roll **(Fig. 2)** the pressure shoe is pressed-on by individual loading elements. The pressure shoe is generally made in two parts. The top and bottom are thermally isolated from each other in order to extensively avoid deformations due to temperature. To achieve the most favorable inlet geometry for the press sleeve, the pressure shoe is shifted towards the ingoing nip. Shortly after the outgoing nip, cool lubricating oil is applied to the inside of the sleeve. A large part of this lubricating oil is removed out of the oil sump that forms ahead of the ingoing nip. The other part of the lubricating oil serves for hydrodynamic lubrication between pressure shoe and press sleeve. If the production speed, linear

Fig. 1: *Application ranges of NipcoFlex shoe presses:*
- *graphic*
- *board*
- *packaging*
- *tissue*
- *pulp.*

Fig. 2: *NipcoFlex Press NFR in top position.*

Fig. 3: *Pressure shoe with additional lubrication.*

Fig. 4: *NipcoFlex and press roll.*

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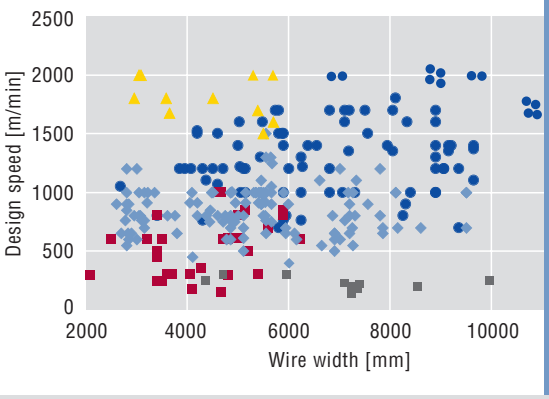

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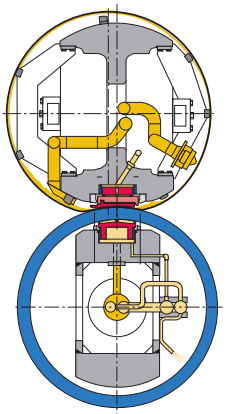

load and nip width require it, additional lubrication (Fig. 3) can be applied in the press nip.

Board and packaging

As mentioned at the beginning, the use of shoe press technology began with the production of board and packaging grades. Almost all new machines for these grades are equipped with at least one shoe press. Shoe presses are also integrated into the press sections during the modernization of many board and packaging paper machines. The pressure profile and linear load are selected taking into account the technological requirements. These, together with the installation geometry in the framing of the press section, define the shoe press module. In particular for the modernization of machines with a small to medium trim width, the use of press rolls as a backing roll for the NipcoFlex proves useful (Fig. 4). For the press roll as a backing roll, all possi-

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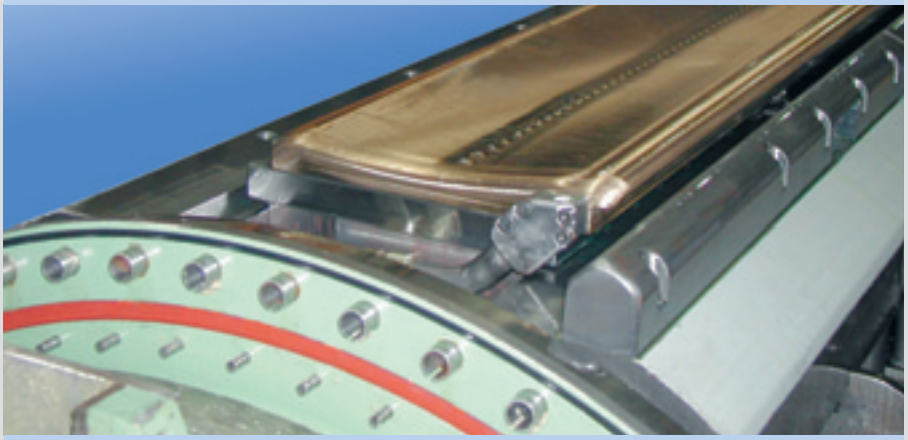

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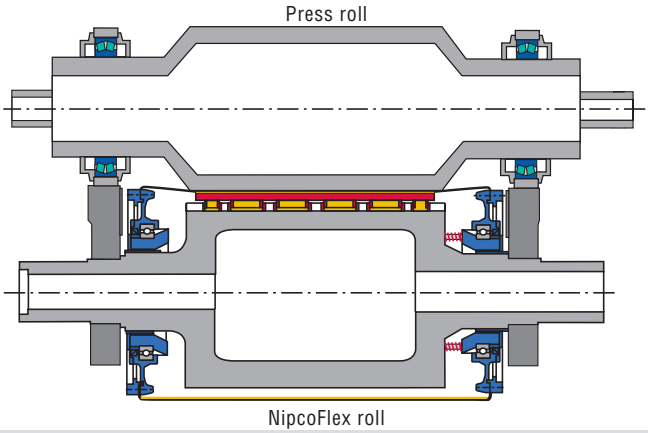
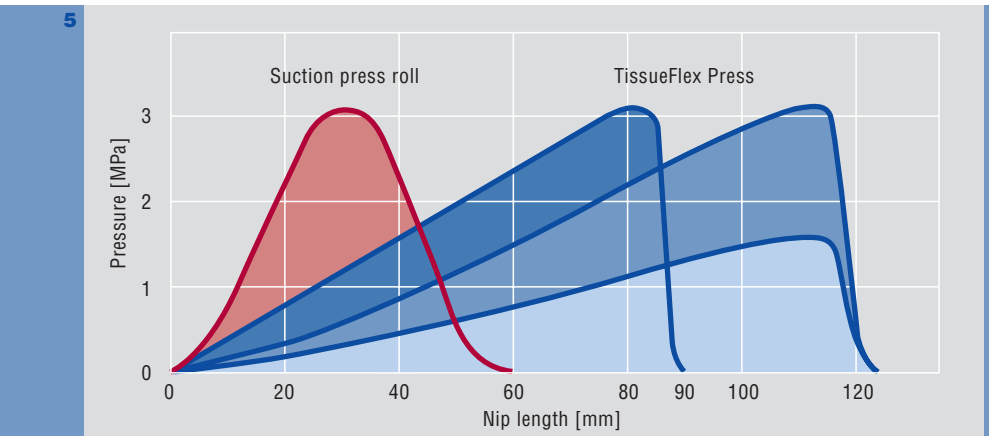
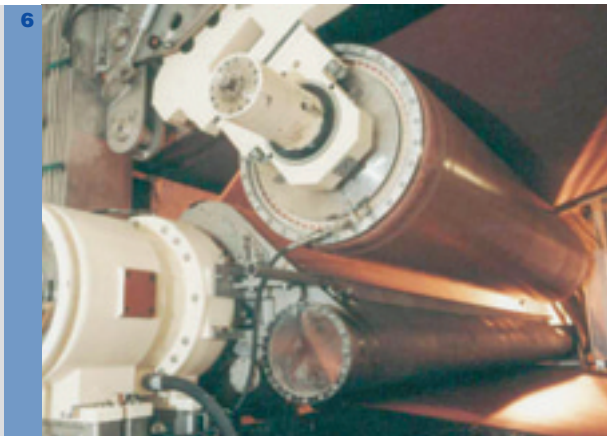


Fig. 5: *Pressure profile of a conventional press nip and a TissueFlex press nip.*

Fig. 6: *TissueFlex.*





ble roll cover variants from rubber to ceramic can be used as for the Nipco P Roll. The press roll is a compact unit that eliminates the bolted connection between roll head and body. A further advantage of the NipcoFlex and press roll in multi-roll presses is the use of CARB Bearing Technology. In this way, efficient shoe press modules can be integrated into compact framing of the press sections. It goes without saying that press rolls can also be used in many graphic paper machines as well as in pulp dewatering.

Tissue

One of the latest developments is the use of shoe press technology in the production of tissue. Ten TissueFlex are currently in operation and another system will start production this year.

A characteristic feature of a TissueFlex module is the flexible press sleeve and the loading of this press sleeve over the concave pressure shoe. The advantages of an extended press zone permit gentle dewatering with flat pressure gradients and low max. pressures compared to conventional presses. The pressure profile in the nip can be established by the shoe contour and is particularly characterized by the steep pressure drop in the outgoing nip **(Fig. 5)**. This is not possible with conventional rolls and permits the minimization of rewetting. Particularly in the production of tissue – where maximum specific bulk in addition to high drynesses is required – this is of great significance. The maximum linear loads depend on the loadability of the Yankee dryer and are up to 200 kN/m.

To meet the special requirements of tissue production, the loading unit, the pressure shoe and the flexible QualiFlex press sleeve have been specially further developed for use with tissue. On other functional parts the well proven technology of the NipcoFlex has been taken over from packaging paper and graphic paper applications **(Fig. 6)**. The flexibility of the pressure shoe and the type of pressure shoe loading by individually adjustable front-side and drive-side loading cylinders ensure an even moisture profile.

Pulp

Through the economic advantages of shoe press technology and the high drynesses, NipcoFlex Presses are increasingly used for pulp dewatering. This applies both to new machines and to the rebuild of existing installations. Due to the high linear loads required and the, in many cases, large working widths of the pulp dewatering machines, the Nipco P Roll is suitable as a backing roll for the NipcoFlex shoe roll. The Nipco P Roll **(Fig. 7)** unites the advantages of position-stable support with the features of a

Fig. 7: *Longitudinal section of a Nipco P Roll.*

Fig. 8: *NipcoFlex Calender.*

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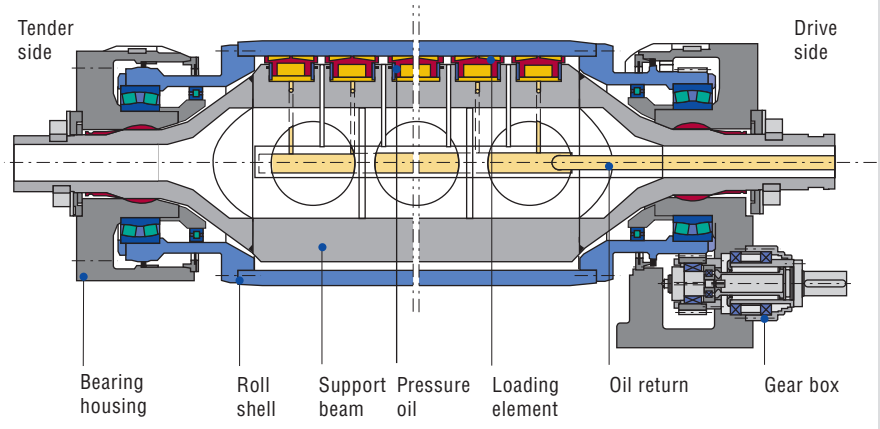

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conventional Nipco Roll on which the roll sleeve is hydrostatically supported by hydraulic loading elements. The fact that the Nipco P Roll sleeve is directly supported in the plane of the bearing center distance makes it independent and position-stable with respect to the unavoidable cross shaft deflection. This in turn permits the most uniform linear load distribution in cross direction of the press nip. The loading elements in the NipcoFlex and Nipco P are characterized by equally large pressure areas, which enable the joint supply of hydraulic oil to the rolls with one pressure line.

Calendering

Shoe nip technology is now also used for the finishing of board. On the basis of the proven NipcoFlex technology, the NipcoFlex Calender **(Fig. 8)** has been developed. In contrast to conventional soft calender technology, the NipcoFlex Calender is characterized by the functional separation of the main operating parameters of nip pressure and dwell time in the nip. This allows specific thermoplastic deformation of the paper and board. Here, too, the possibility of varying the pressure profile in the nip is of decisive importance. The first commercial installation went on stream at the beginning of this year. Intensive research and pilot trials are being conducted at the moment in order to evaluate the potential of shoe press technology for further calendering applications.

Outlook

Shoe press technology is today state of the art in the dewatering of board and packaging papers as well as graphic papers. This is proven by the success of over 400 shoe presses in operation for these grades. For the newer applications, pulp dewatering and tissue, the trends are clear: in addition to the very important increase in dryness and productivity for the user, technological result can be improved still further with shoe presses, especially for tissue. The latest development, the use of shoes presses in calendering, will certainly still require further trials and also operating experience. However, the significant advantages of shoe press technology have already been confirmed today: the possible variation of the pressure in MD as well as the independence of nip width and linear load.

1

Hengfeng PM 12 –
new quality benchmark for cigarette paper

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"We want to become China's leading manufacturer for cigarette papers, both in quality and quantity." With this statement, Mudanjiang Hengfeng Paper contacted Voith in the summer of 2001. A little less than two years later, at the end of June 2003, the PM 12 started production at 80% of design speed and was handed over to the customer after successful trial operation on July 8, 2003. The official inauguration with a festive ceremony was on August 8, 2003.

The contract

Voith was able to demonstrate its system competence also in the area of specialty papers. The scope of responsibility included the complete production line from chemical pulp preparation to winding, including secondary plants, broke preparation as well as chemical additives metering and fiber recovery.

The project

The project managers, one each from the customer and supplier, had to face two large challenges.

The first task was to meet a very ambitious schedule – just about 17 months would elapse from project start to saleable paper. The difficult climatic conditions were an additional problem. For example, the necessary data for the building had to be available within a very short period of time to allow completion of the building in time before winter began. In addition, it was necessary to store all rolls with temperature-sensitive covers on the construction site before the first frost.

The second task was not as obvious, but the basic condition for success. How do the project managers ensure smooth communication between specialists from very different cultures?

An interesting observation was made in the course of this project: The teams from the customer and supplier became one team within just a few weeks. This team, composed of competent experts, pursued a common goal in a professional

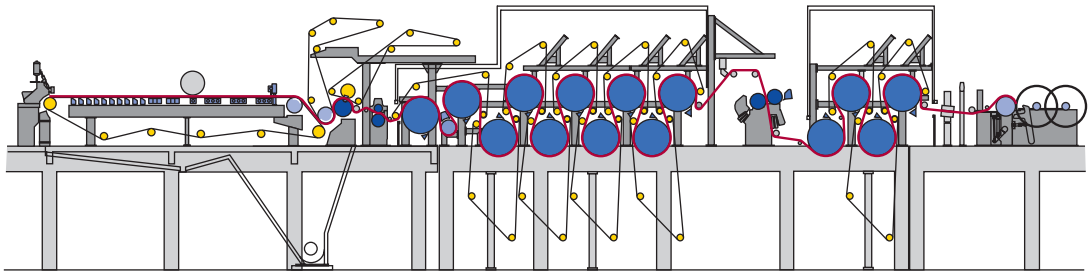

Fig. 1: *Mudanjiang Hengfeng Paper Group Co. Ltd.*

Fig. 2: *Layout PM 12.*

manner. The success and the highlights mentioned here are a consequence of this symbiosis.

During the first meetings it already became clear that the communication between the customer, supplier and local engineering contractor worked excellently.

Based on a jointly optimized delivery schedule, it was possible to start erection three weeks earlier than planned. The erection work, carried out by the customer and supervised by Voith personnel, was very soon far ahead of schedule.It was, therefore, possible to complete erection at the construction site eight weeks ahead of the scheduled date, managed excellently by the customer.

The startup process already promised to be record-breaking: after starting at 80% of max. operating speed, it was possible to produce cigarette paper of high quality at 100% max. operating speed after only eight weeks. Only 5 months after start-up, Mudanjiang Henfeng Paper produced high-porosity cigarette paper on its PM 12 at a speed that is 15% above its layout. On the one hand, this is due to the technological competence of the customer and its highly qualified personnel, and on the other hand it is due to the proven and at the same time innovative machine concept.

The machine concept

On two lines for long and short-fiber pulp, the customer is able to make use of the advantages of the TwinFlo refiners in an excellent way: in order to maintain porosity within the narrow limits required, a freeness value that can be exactly adjusted and, above all, is constant over time is of fundamental importance.

A highly efficient cleaner plant, operating according to the EcoMizer concept, as well as the MultiScreen pressure screen, especially designed for low-pulsation and uniform stock throughput ahead of the headbox, ensure a very good uniformity of the stock suspension ahead of the headbox and in the machine direction paper profile. The use of ComMix for stock component mixing and HydroMix for the necessary stock dilution additionally reduces the stock volume in the system and, therefore, allows fast grade changes.

A RollJet K headbox ensures uniform distribution of the stock across the machine width. Just as the freeness and the aproach flow system are important for uniformity in machine direction, the headbox is the decisive link for uniformity in cross direction. Hardly any other supplier beside Voith can offer a product in this area that is as mature and perfected. This headbox is still being developed

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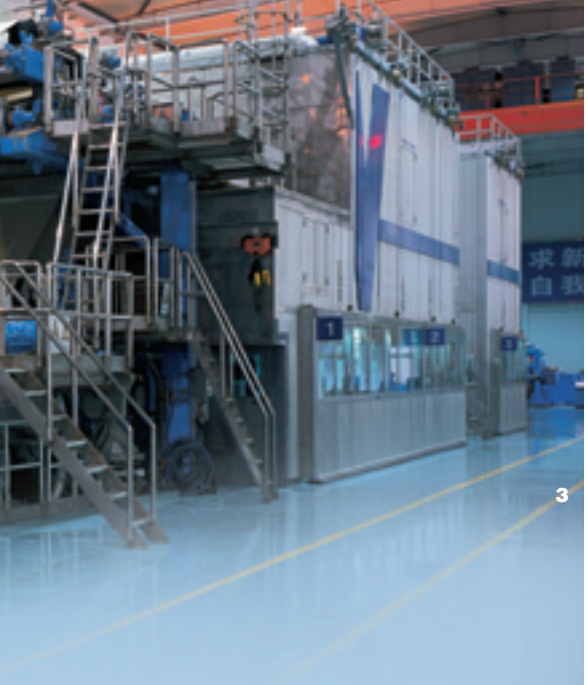

Fig. 3: *Hengfeng PM 12.*

Fig. 4: *TwinFlo double disc refiners.*

Fig. 5: *SpeedFlow.*

Fig. 6: *Final section PM 12.*

Technical data

Paper grades	cigarette paper
Sheet weight	25-45 g/m^2
Wire width	3,800 mm
Untrimmed working width	3,300 mm
Design speed	600 m/min
Operating speed	190-350 m/min
Theoretical gross production	41 t/24 h

further, because the rectifier roll can offer advantages especially with stock of a high freeness.

The high requirements for cigarette paper on porosity and formation at the same time are a challenge for wire section dewatering. In order to achieve optimum formation, a DuoShake is used. The benefits of this reaction-free shaking unit, which is unique on the market, were so convincing for Hengfeng that the existing shaking unit at the PM 10 was replaced at the same time.

The Combi 2 press is characterized by the closed web run from the wire section until after the second press nip. Hence, the first free draw is after completion of mechanical dewatering. Due to the low sheet weight, high paper strength is the basic condition for high machine efficiency. The following marking press is feltless and includes the Nipco technology. Thus, the linear force and, therefore, the intensity of marking can be adjusted over a wide range – and with roll lives that are two to three times longer!

Small dryer groups and sheet stabilization ensure the maximum machine efficiency also in the dryer section. A SpeedFlow ensures a uniform application of glow salt and size. The proven reel ensures an excellent wind-up quality. In addition, Voith is responsible for broke preparation, the chemical additives preparation and metering as well as fiber recovery.

Voith Fabrics has an important share in the high quality of the end product. For example, one hundred percent of the press felts and dryer fabrics are from Voith Fabrics. In the press section, Omega 2 felts are used, and in the dryer section, the Velvet and Quantum II dryer fabrics. These innovative products, along with the paper quality, also improve the machine efficiency and production line efficiency.

Perspectives

With Voith, Hengfeng have found a partner who is available for technological support even after the guarantee period. This is particularly important for specialty papers. We are therefore very pleased that Hengfeng appreciated our performance with the placement of a subsequent order in September 2003. From autumn 2004, the new PM 14 will produce filter wrapping papers.

After Minfeng PM 18, Voith again proved with Hengfeng PM 12 that Voith is the first-choice supplier for cigarette paper lines. At the same time, Hengfeng took a long step towards their goal of becoming the leading producer of cigarette paper in China.

Adolf Jass Paper Mill, Schwarza, Germany – another complete production line for packaging papers

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A total of four orders received by Voith within one year for the delivery of packaging paper production lines underline impressively the customers' high confidence and Voith's process competence in the field of packaging papers.

After Voith had won three orders for packaging paper production lines since December 2002 (Cheng Loong/Taiwan, Varel/Germany and Emin Leydier/France), the most recent order in this impressive series was signed by the German paper manufacturer Adolf Jass in late November 2003. The paper mill Adolf Jass GmbH & Co. KG, Fulda, Germany, placed an order with Voith for the delivery of a complete state-of-the-art production line for testliner and corrugating medium from 100% recycled furnish. The order includes the stock preparation equipment, the paper machine, and a winder at the end of the process.

The new line will be set up as a greenfield mill in Rudolstadt-Schwarza, Thuringia, Germany. This investment will be not only a milestone in the history of Adolf Jass Paper Mill, but also a decisive developing factor for the region around the mill location. The new mill is expected to create more than 200 new jobs at the location and more than 250 additional new jobs in the region.

Based on the One Platform Concept, the new line, same as the three lines ordered earlier, will be built according to Voith Paper's industrial design standard. Since this design has almost become standard for "graphic paper machines", the Schwarza mill will be the first to use this advantageous design in "packaging paper machines".

Stock preparation

Schwarza's stock preparation system is designed for a capacity of 1,300 t/24 h finished stock from 100% recovered paper. The entire process equipment – from bale dewiring and conveying to pulping, followed by screening, fractionation and thickening, as well as process water treatment and rejects handling – will be supplied by Voith.

The bale dewiring equipment, consisting of only one unit, is being supplied by B+G Fördertechnik, and will be capable of handling the full capacity of about 120 recovered paper bales per hour. Proven B+G conveyors are used for feeding the bales to the dewiring equipment and to the drum pulper.

In addition to the mills in Düren-Niederau, Burg, Hürth and Schwedt, the TwinDrum at the Schwarza mill will be the fifth of six TwinDrum pulping systems

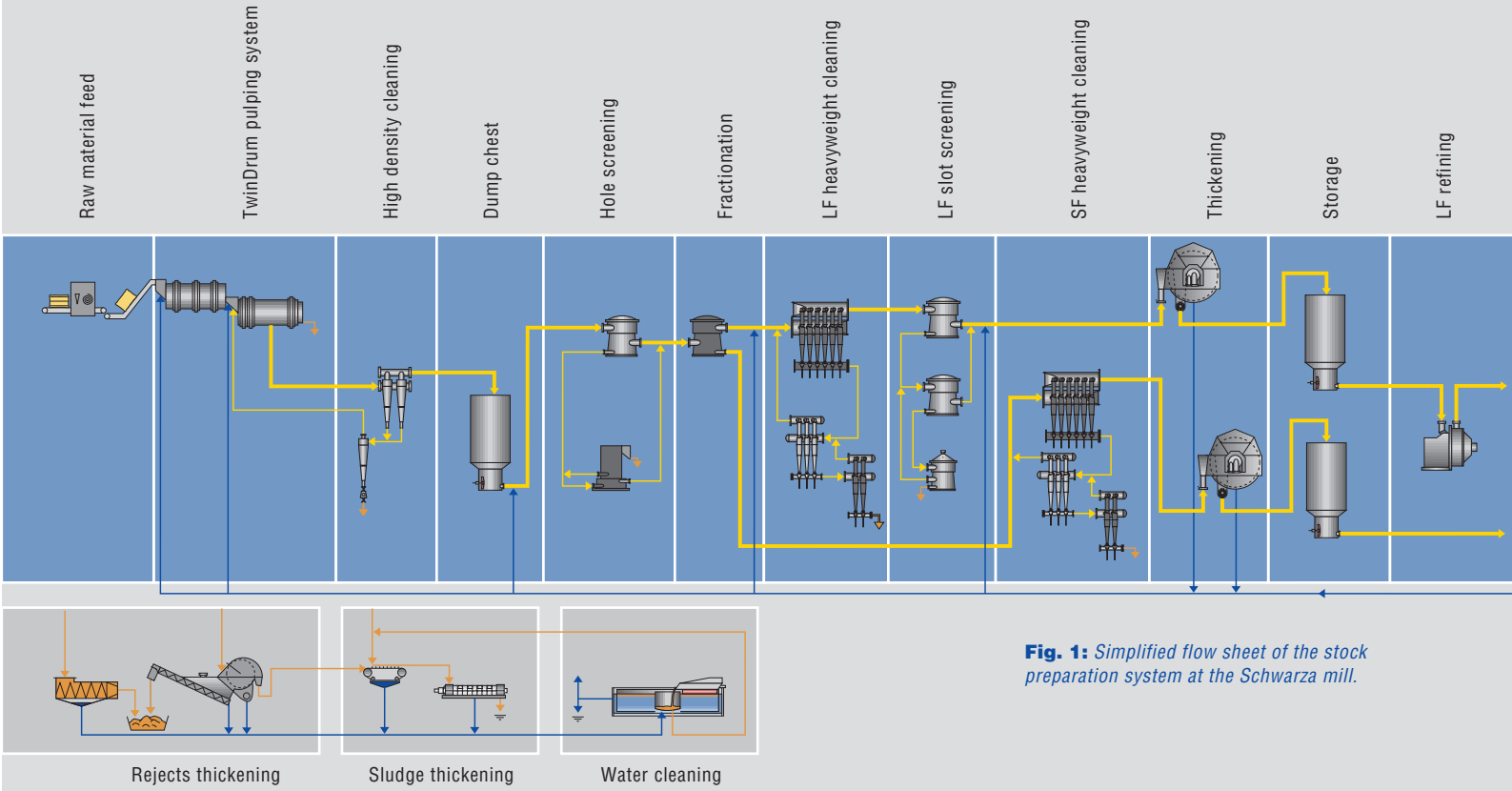

Fig. 1: *Simplified flow sheet of the stock preparation system at the Schwarza mill.*

operating or planned to be installed in Germany. With a capacity of 1,300 t/24 h of finished stock, Schwarza will operate the TwinDrum pulper with the highest pulping capacity up to now.

The drum pulper's principle has been described in detail in *twogether 9*.

Based on the positive experience with the TwinDrum pulping system at the Burg mill, two-stage hole screening with an MSS screen (1.6 mm holes) in the first stage and a Combisorter in the second stage will be used. This concept ensures efficient, cost-effective and space-saving coarse screening.

After pre-screening, an MSF fractionator separates the stock into short and long fiber fractions. While the short fiber fraction will be clean enough to be just passed through cleaners before being thickened, the long fiber fraction is first fed to EcoMizer cleaners and then to a three-stage LC screening system with 0.20 mm slots.

Jass has thus adopted a simple, yet clear stock preparation concept with the aim of removing disturbing components from the stock as early as possible. Consequently, screening in the approach flow system is merely a policing function.

By installing Voith Bagless disc filtering for thickening the short and long fibers, Jass has selected the most advanced disc filter technology available, as presented in detail in *twogether 16*.

The stock preparation philosophy used in the Schwarza mill will ensure the required end product quality is achieved without the need for dispersion.

The rejects handling machines, such as magnetic separators, shredder and compactors, will be supplied by Voith Paper's joint venture partner meri. For water treatment the well-known DeltaPurge and Elephant units have been selected. For sludge thickening, a gravity table and a Thune screw press will be installed.

Paper Machine

The forming section of the Voith paper machine is equipped with a **DuoFormer Base** including a two-layer **MasterJet**

Fig. 2: *In the presence of Jürgen Reinholz, Minister of Economy for Thuringia Land, Germany (3rd from left) and other guests, the foundation stone was laid by Jass company representatives Mrs Jass-Teichmann, Adolf Jass (4th and 5th from left), Angelika and Holger Prinzhorn (outside right).*

2

headbox and a **ModuleJet** dilution water system for the bottom layer. This means optimum CD profiles and strength properties, while ensuring an economical use of raw materials. The **DuoCentri NipcoFlex** press technology guarantees excellent runnability and high dryness.

The single-tier **TopDuoRun** dryer concept is used for the entire pre-dryer section and the first three dryer groups of the after-dryer section. The last group of the after-dryer section is designed as a two-tier **CombiDuoRun**. In addition to other Voith components, DuoStabilizers and ProRelease boxes are also installed in the dryer section.

A **SpeedSizer** unit is used to achieve uniform film application. The web is wound on a **Sirius** reel which is equipped with a centerwind drive and a RollMaster roll hardness control, allowing top-quality parent rolls of 4,400 mm diameter to be wound. An automatic roll transport system between Sirius and winder is installed at the end of the process. A fully automated **VariFlex L** winder with flying splice technology rounds off the perfectly tuned One Platform Concept.

Besides, a Voith automation package will be delivered. In addition to the basic package for the machine control system, allowing optimal control functionality, the automation package also includes the **Profilmatic M** CD profile control system for the MasterJet headbox, a ModuleSteam steam blow box for the press section and ModulePro nozzle dampers for the after-dryer section. The machine and the main components of the stock preparation system will be equipped with the condition monitoring system of Voith Paper Automation.

The order package also includes two complete sets of machine clothing supplied by Voith Fabrics for the forming, press and dryer sections.

The paper machine will produce testliner and corrugating medium in a 75-125 g/m^2 basis weight range. The daily production will be 1,300 tons at a maximum operating speed of 1,400 m/min.

The order for the delivery of this packaging paper machine for Adolf Jass underlines impressively Voith's leading position with regard to packaging paper technologies. The first in an impressive series was the order for an entire production line, from stock preparation to finishing, from the Taiwan paper manufacturer Cheng Loong in December 2002. In May 2003, two orders from the European market followed: a paper machine for Varel Paper Mill, Germany, as well as a production line for Emin Leydier Paper Mill in Nogent-sur-Seine, France. The new production line for Adolf Jass Paper Mill in Schwarza, Germany, rounds off a highly successful year and confirms the paper industry's confidence in reliable technologies well tuned from the raw material to the final product.

1

Zülpich PM 6 –
still one of the most productive paper machines for Testliner and Corrugating Medium

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For many years now, the name of Kappa Zülpich Papier has been standing for a highly successful papermaking company. The philosophy of Kappa Zülpich's management is to consistently optimize both performance and efficiency of the two paper machines in Zülpich. This applies especially to PM 6, which has been optimized in the past years, both by Kappa Zülpich itself and in close cooperation with Voith. With a specific production rate of 221 tons per meter working width and day at a basis weight of 140 g/m², PM 6 is today's most productive machine in the world.

The Kappa Zülpich Papier Company, Germany

Zülpich has a long papermaking tradition. As early as 1873, the first paper had been produced at this location. Over a long period of time, straw was used as raw material, before they started to produce corrugating medium base paper from recycled furnish in 1962.

Over the years, Kappa Zülpich grew into an internationally active papermaking company and today, it is a highly successful and well-established international competitor.

On two production lines, Kappa Zülpich Papier produces testliner and corrugating medium for the corrugated board industry. PM 4, which had been installed in 1970, was adapted to the increasing market requirements by rebuilds in 1977 and 1991. In 1996, PM 6 was taken into operation. Both paper machines together have a production capacity of approximately 400,000 tons per year.

Fig. 1: *Kappa Zülpich Papier, Germany.*

2

PM 6 – Excellent Performance from the Very Beginning

In the mid-1990s, Kappa Zülpich took a decisive step to face the ever increasing international competition by investing in a new paper machine. Voith delivered the PM 6 with a wire width of 5,600 mm and a maximum production speed of 1,000 m/min at that time.

The machine concept comprises a horizontal DuoFormer CFD with a high drainage capacity, even at high basis weights and speeds. The press concept includes a tandem NipcoFlex press with a single-felted second nip. The dryer section was designed in close cooperation with the customer and has some special features, such as dryers with a diameter of 2.20 meters and a ropeless tail transfer system. At the time, Kappa Zülpich was the first customer to use this type of ropeless system for packaging papers with higher basis weights, which had been used exclusively for graphic papers until then. A conventional size press is used for surface treatment. A fully automatic reel rounds off the well-tuned machine concept.

The Long-Term Optimization of PM 6

Together with Voith, the first strategic optimization measures were taken in the year 2000. Installing a double doctor at the first dryer and coating several dryers to prevent stickies or other sticky impurities from adhering to the surface were the first effective steps to be realized. In line with the long-term optimization concept, web stabilizers and ventilating doctors were installed in the after-dryer section in the following year, thus significantly improving both web run and CD moisture profile.

Another measure was to upgrade tail transfer with optimized blow nozzle systems in the pre-dryer section.

In September 2003, the most extensive rebuild so far was carried out, with the target to increase machine speed from the previous maximum of 1,050 m/min to 1,200 m/min in the future, without impairing technological sheet properties.

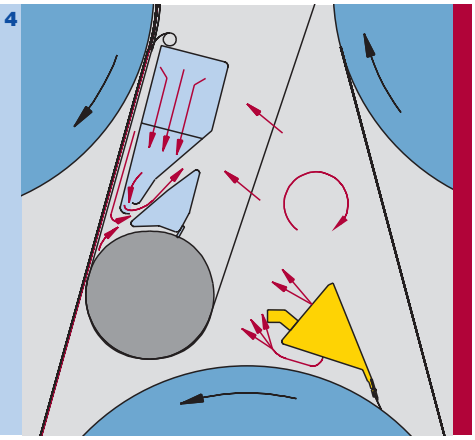
One of the key measures was to rebuild the DuoFormer CFD to improve drainage capacity and to adapt it to increased machine speeds. The existing forming roll, with a diameter of 1,260 mm, was replaced with a new vacuum-augmented forming roll with a diameter of 1,760 mm. Because of the new, much larger forming roll, the top wire suction box and its water discharge channels on drive side, as well as the bottom wire deflectors, were modified.

In the press section, a new double doctor system was installed at the plain bottom roll of the second press nip which can be pivoted completely for maintenance purposes. Absolutely reliable doctoring is now guaranteed in this critical area where

Fig. 2: *DuoFormer CFD at rebuild.*

Fig. 3: *PM 6 after start-up.*

Fig. 4: *Scheme of ventilating doctor.*



the paper is subjected to the first open draw. A Fibron transfer system with a universal P&T transfer unit and a VTT vacuum belt was installed after the press section. The P&T transfer unit takes over the paper tail fully automatically from the plain bottom press roll and transfers it into the dryer section by means of the vacuum belt.

As a prerequisite for a permanent speed increase, all rotating siphons were replaced with stationary state-of-the-art ClearStar siphons for boosting steam and condensate system efficiency. The differential pressure required is much lower than with rotating siphons.

In the sensitive single-tier dryer section areas, after the press section and after the size press, the existing suction rolls were lowered and equipped with DuoFoil boxes arranged above. This way, the free evaporation length of the web is extended considerably and the free web run is stabilized. The DuoFoil works according to the same principle as the DuoStabilizer. The only difference is that with the DuoFoil, the box is evacuated through the suction roll arranged underneath, whereas the DuoStabilizer operates as an outside suction box for the drilled roll positioned below it.

New web stabilizers were installed to achieve a more stable web run in the conventional, two-tier dryer groups of the pre-dryer section. In order to improve pocket ventilation, and consequently the CD moisture profile, the existing dryer doctors were re-built. Special Voith ventilating doctors were used which have been specifically developed for the heavier basis weights of packaging papers. The doctor back of the ventilating doctors is used as a “cross distribution pipe” and is equipped with evenly distributed holes. This way, the hot air is emitted right at the point of highest evaporation of the web and, therefore, maximum humidity. An essential advantage of these ventilating doctors is that no major rebuilds are required in existing dryer sections. There is no need to install additional cross pipes in the very narrow pockets, since the existing doctor back can be re-built or replaced with a new doctor back in the same position **(Fig. 4)**.

These steps were taken based on the positive experiences made by Kappa Zülpich a year earlier with the same rebuilding measures in the after-dryer section.

Conclusion

Today, PM 6 is able to produce testliner and corrugating medium in a basis weight range of 90-140 g/m^2 at 1,100 m/min. Kappa Zülpich’s well-defined optimization strategy and the good cooperation with Voith have made it possible that even seven years after installation, PM 6 still ranks among the world’s most productive machines.

Kappa Zülpich is a successful example of how a company can adapt to the market’s rapid development and growing demands thanks to intelligent optimization measures and the right partner. Kappa Zülpich’s success story underlines once again that strategic optimization and close cooperation with a strong partner are key factors for boosting efficiency and increasing profitability.

Excellent threading performance achieved at Condat

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Condat, a member of the Lecta Group since 1998 together with Garda in Italy and Torras Paper in Spain, is a manufacturer of woodfree coated papers. In autumn 2001 Condat decided to carry out an important re-build of line 89 within the scope of the Lecta Group's investment program.

Before the work began, the customer stated clearly the most important goals for this major optimization plan. The target of the first stage was to improve the formation process and overall machine productivity through reduction in both the number and duration of breaks. A major part of this included reducing threading times and the clean-up times after a break.

After 10 years of production Condat line 89 faced some specific problems; an inefficient forming section, a large number of breaks in the dryer section, long clean-up times and an unreliable and slow threading process. The threading was difficult mostly due to the on-line coaters on this paper machine. After completing a comprehensive threading analysis for Line 89, the following problems were identified with the original threading process: threading of coater 1 was difficult and inconsistent; the tail ran out of the ropes between the dryer sections; threading performance varied with crews; manual threading was compromising operator safety and the clean-up times were long after dirty thread-ups.

Voith received the order for the re-build of line 8 in March 2002. The scope of delivery included DuoShake, DuoFormer D and JetFlow F components along with three VTT conveyor sections, complete erection, personnel training and start-up supervision.

The DuoShake installed on Condat's PM 6 had already proven its efficiency. DuoShake contributes to the quality of formation by allowing the MD/CD ratio to be reduced. It also ensures that no disturbing vibrations are produced. The DuoFormer D is a hybrid former with optimum position on the wire and an efficient design of the top wire suction box and counter blades. The JetFlow F is a free jet coating system that can be easily incorporated into the coaters, taking the place of the applicator roll. With JetFlow F the web no longer has to pass through a nip which reduces the risk of breaks. The design and control of JetFlow F and the coating color circulation system prevents contamination, which significantly reduces cleaning efforts after a break.

A TEAMS assessment (Threading Evaluation And Managed Solutions) was conducted by the Voith Tail Threading Group (TTG) before the optimization to identify threading problems. In the TEAMS assessment phase, two Threading Process

Fig. 1: *Before and after chart for production capacity, speed and grades at Condat line 89.*

	Before	After
Wire Width	5,768 m	5,768 m
Paper Width	5,245 m	5,245 m
Paper Weights	90-135 g/m^2	90-135 g/m^2
Design Speed	1,000 m/min	1,200 m/min
Capacity	566 tons/24 h	592 tons/24 h

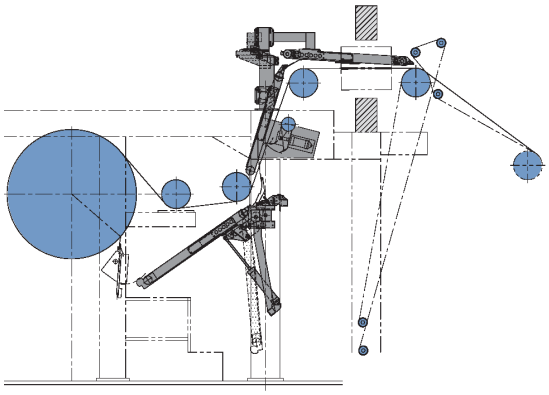


Fig. 2: *VTT Turbo conveyor installed at Condat.*

Fig. 3: *Dryer to size press drawing; optimized threading at Condat.*

Fig. 4: *Threading times before and after optimization.*
Before optimization
After optimization

Specialists visited the mill and examined all current threading processes thoroughly. They discussed the threading difficulties with personnel at the mill and developed a detailed optimization plan based on their findings.

The first problematic threading section was Dryer 52 to the last Coater ropes section. Originally, the tail was transferred into the rope nip by air nozzles located under a mini doctor blade. This system did not operate properly and required operator involvement when blowing the tail into the rope nip. The new solution from Voith TTG included a multiple VTT Turbo conveyor system to stabilize the tail, eliminate the double tail and to provide a reliable, controlled transfer into the rope nip. The VTT Turbo conveyors are built with internal turbines that generate a large amount of vacuum. These conveyors also include an internal Drum Drive for efficient operation and space savings. This section was rebuilt during the summer of 2002, approximately eight weeks before the main shut, allowing a smooth and efficient take-over for the operators. This contributed to a good start-up after the main rebuild as the operators were already familiar with the new threading technology.

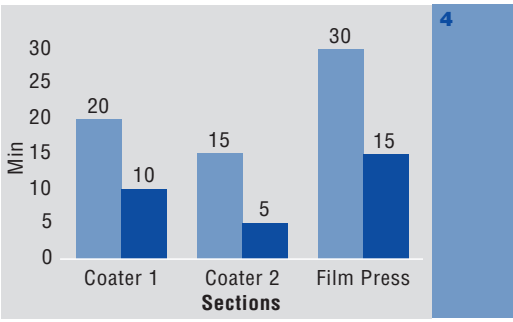
The second optimized section was the Dryer to Size Press section. Again, the original system used air nozzles to blow the tail into the ropes. This manual system was very unreliable and compromised operator safety. The optimized solution included a multiple VTT Turbo conveyor section with a Flip Tray transfer device and a Tail Ripper. The Flip Tray was mounted directly on the dryer cylinder doctor to allow for the movement of the scanners and other equipment. The purpose of the Flip Tray was to stabilize the tail during the transfer. The Tail Ripper was used to efficiently eliminate the double tail.

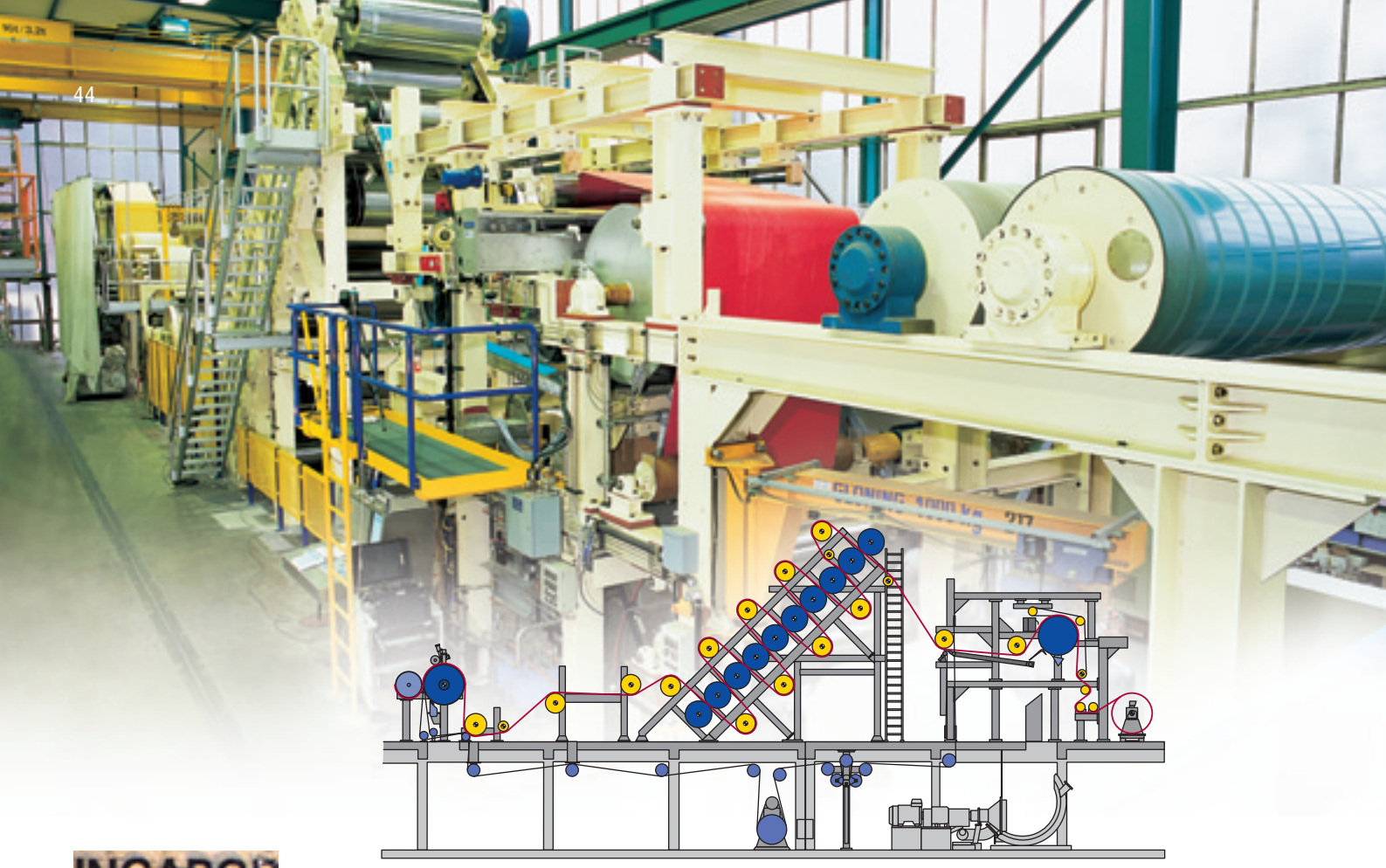
The third section to be optimized was Dryer 2R to the 1st Coater Ropes section. Again, air nozzles were used in the original transfer. As the air nozzles were located under the doctor blade, the system didn't operate properly and required operator involvement. The new solution included VTT Turbo conveyors, a Flip Tray and a Tail Ripper. In this section, the Flip Tray moves the tail onto the conveyor where the tail is kept under control and transferred into the rope nip. The rope nip was also relocated to allow for a better tail transfer into the coater ropes.

The results of the optimization process were exceptional. Right after the system start-up, threading was successful 85% on the first attempt and 100% within three attempts. Threading times were also significantly reduced allowing for increased machine efficiency and production. Other benefits from the optimization included elimination of double tail, no manual intervention, improved operator safety, limited maintenance requirements and space savings. Voith TTG took full ownership of the threading process during start-up resulting in a significant threading improvement.

Within six months of the start-up, total time losses at the coater sections had been reduced by 35%. The optimization resulted in a significant 65% reduction in threading downtime. The mill and operators are also impressed with the reliability of the threading system and the effect the system has had on operator safety. The ultimate result of this optimization is a 4% increase in total machine efficiency.

In a very short time, less than seven months, this installation has proven to be very successful. The co-operation between Voith and the customer Condat made it possible to reach all the deadlines and make this installation a true success.





Elisabeth Rooney

Finishing, Tail Threading Group
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Voith Tail Threading pilot machine

Voith Tail Threading Group now has a Threading Pilot Machine, TailPlus, in Voith's Heidenheim (Germany) R&D facility. The TailPlus Pilot Machine was developed to offer customers complete threading support including product and applications testing.

The TailPlus machine is capable of testing all grades and speeds up to 3,000 m/min. The sheet width varies from 500 mm to 800 mm. The machine is located together with the main Voith pilot machine in the Heidenheim Research and Development centre.

The TailPlus machine contains the following machine sections; unwind unit, last dryer cylinder, felt, simulated Janus calender and a Sirius Reel. These sections are located on the machine to accommodate optimization of tail threading in the dry end (reel threading). The machine is also used for optimizing threading for high speeds and demanding sheet runs.

The equipment on the pilot machine includes a wide range of threading optimization solutions. A WaterJet TailCutter is installed to cut the tail on the dryer can.

A VTT Turbo conveyor with a TT3000 transfer device is installed to pick up the tail from the dryer can. For certain installations, a Flip Tray transfer device can also be used. The VTT Turbo conveyor moves the tail onto another conveyor and into the rope nip on the Janus Calender.

The tail is transferred through the Janus Calender and onto the Sirius Reel with a rope system.

A high speed digital camera system, WebVision, is also installed on the threading pilot machine. This allows the customers a slow-motion view of the threading process.

The purpose of the threading pilot machine is to create a facility where the customers can get their specific threading applications tested, and to provide a full R&D facility for threading optimization and product development. Currently, tests for Leipa Schwedt PM 4 and Maxau PM 6 are being carried out. The test facility has proven it's usefulness as a customer specific testing site and an R&D facility.

Strato Series –
rubber covers in the paper machine

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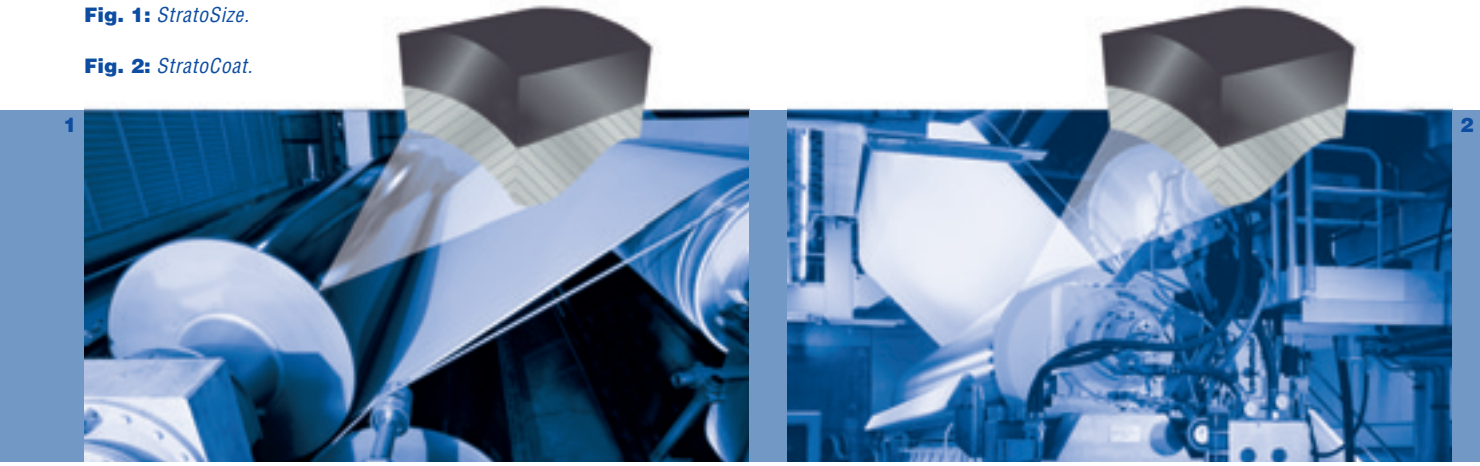
Roll covers in the paper machine can have a major impact on the quality characteristics of the finished paper. At Voith Paper we engineer our roll covers to meet the demanding requirements of the paper maker. These requirements are both for excellent paper quality and predictable, extended run cycles.

Rubber covers are widely used in many different functions in a paper machine from wire rolls to reel drum covers. Each position has different quality requirements for the roll cover. When selecting the correct roll cover, we must consider the specific application and the requirements of that application. However, each application has one common requirement-abrasion resistance.

In the press section of a paper machine the roll cover needs to provide consistent, efficient dewatering capabilities and provide excellent sheet release for low draw and improved operating efficiencies. In the sizing and coating section the roll cover plays an even more important role in the surface characteristics of the paper. The correct roll cover must provide a homogeneous surface for the application of sizing or coating, reduce or even eliminate sheet stealing and misting while providing the correct nip conditions to optimize sizing and coating application. In both the press and sizing/coating

Fig. 1: *StratoSize.*

Fig. 2: *StratoCoat.*



section of the paper machine the paper maker is demanding longer run cycles with predictable roll changing intervals to eliminate unscheduled down time and reduce the costs associated with roll changes.

Based on Voith Paper's already proven rubber cover product line our, Research and Development Department began an extensive program to produce a new series of products which improves the wear properties of the cover while maintaining the excellent paper quality attributed to the roll cover. Our search was not only for a new and improved cover compound, but for a testing method that would accurately predict the abrasion resistance of the cover in the paper machine. The result of our research and development was an abrasion testing method that more closely simulates machine conditions and a new series of covers called Strato:

StratoPress S and **SR** for demanding suction press applications

StratoPress for demanding soft press applications (plain or blind drilled)

StratoSize for puddle size press and film press applications

StratoCoat for film and blade coating applications.

The new abrasion testing method is part of our entire testing process called Process Simulation Testing which incorporates testing methods that simulate operating conditions and provide excellent correlation between lab results and cover behavior in a paper machine. Traditional abrasion testing methods are done at room temperature under dry conditions which do not provide an accurate correlation between lab results and actual cover wear in the machine. Our new abrasion testing is done under conditions similar to actual operating conditions in order to accurately predict results seen in operation.

The Strato Series of covers provides extended run cycles while maintaining the excellent surface qualities of our existing rubber covers. Using the results of our abrasion testing, we were able to predict run cycles 30% longer than the previous longest running covers. These lab results were confirmed by several field results of Strato covers.

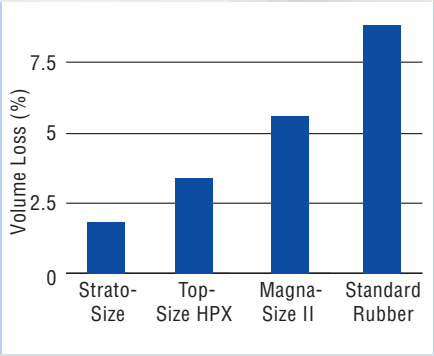
As noted previously, abrasion resistance is important for the performance of press roll covers. Improved abrasion resistance results in covers that not only maintain their crown profile for longer but also, in the case of drilled covers, have minimal hole cupping. This can result in longer times between grinds and improved press performance.

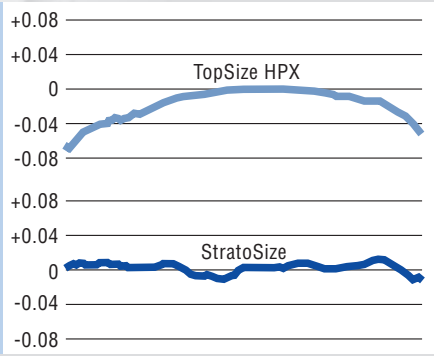
The improved performance of the Strato series over competitors' offerings has been demonstrated on a highly loaded jumbo press on a linerboard machine in the Southern US. A large diameter, blind drilled StratoPress cover was installed in the first press mating against a "super premium, super abrasion resistant" cover from a competitor. Although the covers had the same geometry there was completely unequal performance. When the covers were removed for grinding after a

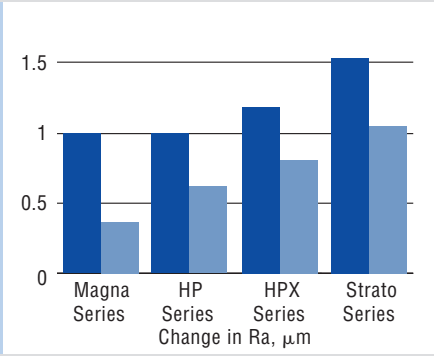
Fig. 3: *Volume loss of several roll covers.*

Fig. 4: *Difference in roll diameter.*

Fig. 5: *Roughness value of several rubber covers at installation and after the run cycle.*
Installation
Removal







6 month run time it was found that the competitor's cover had four times more wear than the StratoPress cover. Unlike the competitor's product, the StratoPress had little hole cupping.

The improved durability and the consistent, efficient dewatering ability of the blind drilled StratoPress cover was seen in the machine performance.

During this 6 month run the customer was able to set a new speed record for the machine on 42lb. (205 g/m^2) linerboard of over 3000 fpm (915 m/min) for four consecutive days.

Lab results of abrasion testing comparing the volume loss of StratoSize to TopSize HPX showed a 46% decrease in volume loss. Fig. 3 shows the volume loss of several roll covers.

This increased resistance resulted in more uniform operating conditions on a large European graphic paper machine producing multi-coated paper in one of our first major field trials of StratoSize. Previously, TopSize HPX was the preferred cover at this mill due to its abrasion resistance and excellent sizing properties. StratoSize has the same excellent sizing properties while maintaining these properties over the run cycle.

Fig. 4 shows the difference in roll diameter versus target diameter between StratoSize and TopSize HPX over similar run periods on the above mentioned multi-coated paper machine.

Another property required for uniform coating and sizing application as well as stable sheet release is surface roughness. A rougher surface allows for easier sheet release. Fig. 5 shows the roughness value of several rubber covers at installation and after the run cycle.

The Strato series has a higher surface roughness which remains rougher during the entire run cycle. This results in more consistent and uniform coating and sizing, and fewer operational changes during the run cycle as the surface characteristics of the cover are more stable.

These product improvements are possible because of the formulation and manufacture of the Strato Series cover. Not only did we develop unique combinations and ratio of raw materials used to manufacture the cover, but we also optimized each individual raw material used to provide the desired physical and chemical properties of the cover. The formulation of the cover compound is responsible for surface wettability, surface tension, resistance to surface deposits, hydrophilic/hydrophobic sites and other cover characteristics. All of these characteristics have an impact on the performance of the roll cover in the paper machine.

At Voith Paper we continuously use our process know-how and Research and Development to bring new products to the market. The Strato Series of rubber covers is our newest product line to meet the increased demands of our customers.


VOITH
福伊特造纸服务中国有限公司开业典礼
Opening Ceremony Voith Paper Service China Co., Ltd.
2003 年 10 月 24 日
October 24th 2003


VOITH


VOITH

Voith Process Solutions Seminar and Voith Paper Service opening ceremonies in Kunshan and Dong Ying, China, October 22 to 27, 2003

Robert Kietaibl

Voith Paper Service China
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Wednesday, 2003-10-22

The event started with a banquet reception dinner in the evening before the seminar. During this reception dinner, the technical discussion and exchange of information between the customer and Voith team already began. All speakers, management members of Voith in China as well as Mr. Ray Hall, Executive Vice President Voith Paper Service and Member of the Management Board of Voith Paper, Mr. Peter Huber, Senior Vice President Europe and Asia of Voith Fabrics were attending this evening. All guests enjoyed a relaxed informative dinner including musical entertainment.

Thursday, 2003-10-23

Voith Process Solutions Customer Seminar

More than 120 customers from 60 different paper mills in China, Korea and Japan attended the Voith Process Solutions technical seminar in Kunshan end of October 2003. Speakers from Voith Paper China, Voith Paper Service Europe, Voith Paper Liaoyang, Voith Paper Service China, Voith Fabrics, Voith Paper Tail Threading Group and Voith Paper Automation gave an update on the latest developments and state of the art technology for the paper industry.

The theme for the seminar was "Voith Process Solutions", a new service approach which evolves from the need of today's papermaker to more efficiently manage the entire papermaking process to achieve lasting profitability. As part of our Mill Service activities Voith Process Solutions will combine all the process knowledge and experience of the Voith Group.

The Voith team has the capability of analyzing the entire paper making process and recommending the most appropriate solution for the customer. The paper maker will get realistic recommendations that will enhance productivity and quality, while providing maximum return on investment.

The result of this 3 day event in Kunshan was more than 110 customer requests requiring follow up, confirmation of new orders and an overwhelming customer response. More than 70% of all our cus-

tomers returned to us a feed back report and we want to present some of these written comments:

Shandong Rizhao SSYMB Pulp & Paper Co., Ltd.
"I am impressed by your two service centers. Voith is responsible to the customers and professional at services. Well-equipped and can meet the maintenance demands for high speed paper machines of the domestic market."

Guangzhou Paper Co., Ltd.
"The Voith Service Network covers more areas than its competitors and the employees are very professional. Good impression, they can follow up for the requirements of customers very well."

Sun Paper Share Co., Ltd.
"The advantage is that Voith Paper Service China can meet customer demands in urgent cases."

Daewoo Paper Mfg. Co., Ltd.
"For our company, which is 4 years in production, the two Voith Service Centers will provide good technical support. Voith Paper Service has already successfully provided one Super Calender roll cover for us in a very short period. Until now the performance of the roll cover is very good. Thank you very much and I hope that we will keep this cooperation partnership in the future and grow together."

On behalf of Voith we want to thank all customers for their attendance and great response to our technical seminar and we are already planning the next event in 2004.

Friday, 2003-10-24

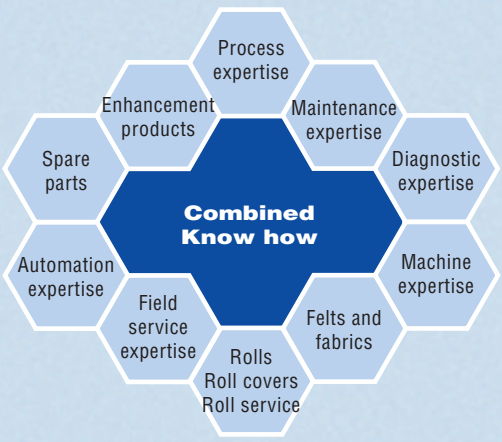
It was a day of information and celebration for the paper makers in North East Asia. In addition to the technical seminar our customers could get an impression of the state of the art manufacturing equipment and processes during the plant tours at Voith Fabrics Kunshan and Voith Paper Service Kunshan. The detailed presentation of the expansion of Voith Fabrics Kunshan into the largest press felt and forming plant in Asia was another high light during these exciting events.

Opening Ceremonies Voith Paper Service China – Kunshan

A further highlight of this 3 day event in the Jiangsu Province was the opening ceremony of the new service center in Kunshan. More than 300 visitors – customers, vendors, contractors, official representatives of the government and the local authorities, co-workers and friends from China and all over the world celebrated with Voith Paper Service in Kunshan. Included in the opening ceremony was a plant tour and a festive banquet lunch with traditional Chinese musical background.

Mr. Ray Hall, former Executive Vice President Voith Paper Service and Member of the board Management of Voith Paper mentioned in his speech:

"It is no accident that Voith Paper Service is co-located here in Kunshan. On this site, Voith Fabrics will soon break ground on a new expansion. Kunshan will become a significant resource center for the paper industry, a further sign of Voith's commitment to this market and to our customers. You see by this tangible evidence of investment, our commitment to the support of our customers and success of the paper industry in China and the region North East Asia. No other supplier to the paper industry has made such a commitment to this extent."



Monday, 2003-10-27

Opening Ceremonies Voith Paper Service China – Dong Ying

More than 100 visitors– customers, vendors, contractors, official representatives of the government and the local authorities, a delegation from Huatai Group and friends from China and all over the world celebrated with Voith Paper Service Dong Ying in the Shandong Province. The plant tour after the official opening ceremony was very impressive to the paper makers and visitors from the Shandong province.

Shortly after its start up, Voith Paper Service Dong Ying developed into the center for grinding and mechanical roll service for the paper industry in north China. The expertise on grinding of high end roll covers such as hard and soft calender rolls and chilled iron rolls is well accepted. Short turn around times and high precision for the increasing demands of the paper machines and all mechanical repairs including rotor refurbishment are in the scope of capabilities of this well equipped Voith Service center.

Voith Paper Service China

365 days a year, 24 hours a day

The team of Voith Paper Service worked endless hours in both service centers to finalize the erection, installation and start up of the equipment. Since June 2003 both facilities are fully operational and running with an excellent utilization rate. Voith Paper Service is manufacturing roll covers in Polyurethane, Composite and Rubber for all applications in the paper machine up to 15 meters length, 2 meters diameter and 80 tons.

In cooperation with the Voith Paper Service R&D centers in Europe and North America Voith Paper Service China has installed the most sophisticated manufacturing line for roll covers. The casting equipment used to manufacture Polyurethane and Composite roll covers allows a 100% quality and process controlled manufacturing of Voith's world wide known High-Tec roll covers. Rubber

roll cover manufacturing is done using the latest state of the art extruding technology on a unique set up of reversing the extruder between two multifunctional lathes, to enlarge production capacity and have highest manufacturing flexibility.

Voith Paper Service China is operating 365 days a year, 24 hours a day, for our customers benefit!

Please feel free to send us your inquiry, visit or contact us at any time, either direct to our local Technical Sales Manager or our general email address service.china@voith.com

Voith Process Solutions –
plant optimization by process analysis

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Every papermaker and mill manager knows the importance of good plant efficiency and consistently high product quality. But it often takes a long time to get that far, and needs of lot of know-how and experience. Voith Paper's vast experience and know-how comes as part of the service package. Highly qualified expert teams in all locations are ready to keep customers' paper, board and coating machines running properly and analyze all process conditions – irrespective of product grade.

Purpose of process analysis

The operating behaviour of modern paper machinery and production lines depends on a wide variety of process conditions, often very complex. Any faults or errors in these processes can significantly reduce efficiency and quality. The purpose of process analysis is to monitor all the operating parameters and conditions as a basis for efficiency improvement measures right down the line, e.g. for better runnability and printability.

Process analysis (Fig. 1) is thus very important for:

- enhancing the overall efficiency;
- ensuring consistently better product quality.

Further modules are in course of preparation, such as for shutdown scheduling and execution.

Each module is transparent thanks to a systematic and well-proven procedure. After thorough process analysis, which can be extended with various measurements, the results are evaluated. This is where the diagnostics start. Based on findings, the weaknesses and improvement possibilities are identified. Afterwards, optimization recommendations are worked out. By agreement with the mill management, the best options are then selected and jointly implemented.

This may involve anything from machine adjustments and overhauls to additional optimization components and training, or even a rebuild.

1 **The Modules**

Production process

Module 1 Productivity
Total efficiency elevation

Module 2 Product quality
Development of quality and increase of quality stability in the individual production stages

Voith process analysis uses modern and structured analytical thinking and problem solving methods

Analysis – Diagnosis –
Recommendation – Execution

Further Modules are under preparation

Voith Process Solutions
Plant optimization by process analysis

Fig. 2: *"Fanning" a high-pressure shower.*

The improvements attained thereby are then checked and documented. In this connection, various types of partnership agreements can be agreed upon for reaching the customer's goals by teamwork with Voith Process Solutions.

Module 1: Productivity

Productivity is primarily improved by the following parameters:

- Reduction of shut down times whether planned or unplanned
- Reduction of broke amount
- Increasing the production rate by raising the operating speed and minimizing break time.

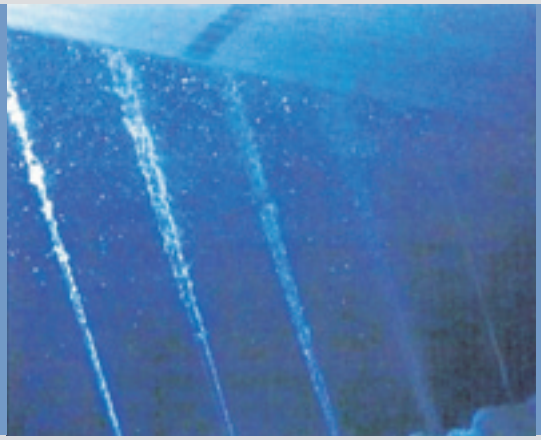
As a renowned paper machinery manufacturer with decades of process experience in most of the paper mills worldwide, Voith Paper is predestined for detecting faults and errors (Fig. 2) and enhancing efficiency by optimizing the respective components.

In particular, Voith Paper has vast experience in taking measures to reduce shutdown times.

Module 2: Product quality

Not only total quality, but, above all, consistently high quality is essential for success in today's markets. This demands systematic discipline. Accordingly, the main tasks of this module are as follows:

- Quality data acquisition and analysis
- Printing results acquisition and analysis
- Evaluation of print comparisons
- Paper fault analysis (Fig. 3)
- Complaints analysis.



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Module 2: Product quality – Example paper defects analysis

3

Which quality group generates the highest loss?
Classification into different ranks organises the priority.

Quality group/Parameter	Loss/Month in Euro	Rank
Holes	38 658	1
Dirt	3 896	5
Doubling	4 539	4
Blistering	3 764	6
Cuts	8 739	3
Size lumps	23 978	2
Slitter dust	2 997	7
Splice problems	341	0
Mottling	2 844	8

For analysing paper and print test samples, Voith uses the latest measuring technology and laboratory facilities in teamwork with renowned printing firms.

To meet such high demands, Voith Paper uses highly sophisticated instrumentation, mobile in part, incorporating the latest technical advances.

Typical example 1

Fig. 4 shows how the operating stability and production output of a modern high-speed newsprint machine were improved after replacing a faulty pressure transducer.

After eliminating the source of trouble, breaks decreased dramatically. And in parallel to these savings in down-time, the 1,600 m/min speed limit was permanently exceeded! A double quality boost was thus attained. (It is apparent that quality benefited also.)

In the end, the key to such success lies in the experience and a systematic and analytical approach of the Voith Paper on-site optimization team. We'll be pleased to tell you more about how this concept can benefit your mill too.

Target groups 5

Product-related
Graphic grades
Specialty grades
Board and packaging papers
Tissue
Carton board

Voith's comprehensive partnership with the paper industry (Fig. 5) is upheld by Voith Process Solutions – the troubleshooting optimizers.

Our teams of paper technology experts, plant engineers and chemical specialists have all spent years in the paper industry worldwide – an unbeatable combination of concentrated know-how and accumulated experience.

Typical example 2

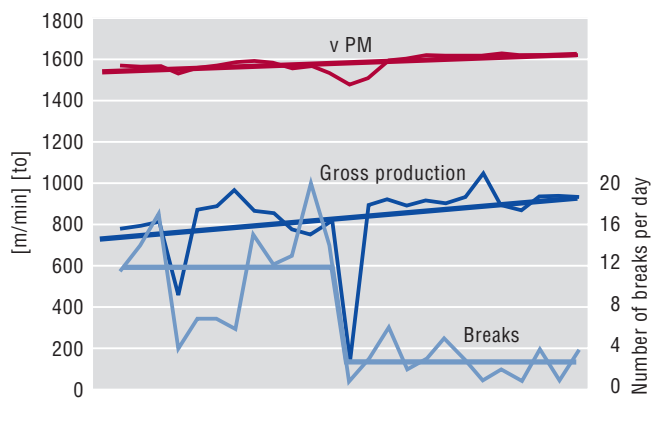
Fig. 6 shows how one of the most productive copy paper machines was successively optimized, thanks to process analysis right down the line from pulp production to roll packaging.

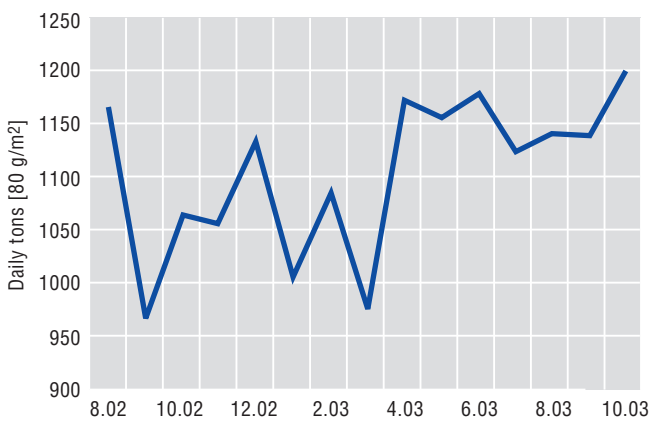
Voith Process Solutions –
Optimization always at your service!

Fig. 4: *Production development and decreases in number of breaks.*

Fig. 6: *Development of monthly average salable production.*

4





6

Voith Process Solutions –
North American case studies

Alex Piquer

Service
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As North American paper producers continue to face economic pressures they are more often seeking improvement through process optimization and low-capital investment projects that deliver high financial returns. Instead of replacing or rebuilding entire machines, the customers pursue sectional improvements to the equipment that they already have. In doing so, they are asking suppliers to be more innovative in approach to machine improvements.

In its first full year of operation, Voith Process Solutions North America has worked successfully with customers and other Voith divisions to provide process optimization and complete solutions to a variety of paper machine problems. The results have produced significant economic returns and process improvements allowing our customers to be more competitive.

The Process Solutions team is dedicated to helping Voith's customers improve the utilization of existing equipment and identify projects with the greatest economic impact on their business. The following cases are a few examples of the results achieved by this new group.

Improving Processes with Low Investments

At Norske Canada – Elk Falls, the newsprint machine began experiencing severe runnability issues and the mill was unable to determine the cause of the problem. Voith Process Solutions provided an experienced paper maker and a diagnostic technician to observe operations and investigate potential causes of the breaks.

Within a few days, the Process Solutions team determined that a large number of holes in the sheet were being caused by rubber being released from tubes recently installed in the cleaners. During the visit, the Voith team also made operational recommendations that resulted in reduced draw between the former and press. These findings and recommendations reduced the holes in the sheet from 250 to 2 per reel and the number of breaks on the machine from seven per day to less than one. For a minimal service fee and no additional capital expenditures, the mill was able to realize a substantial in reduced waste and increased production.

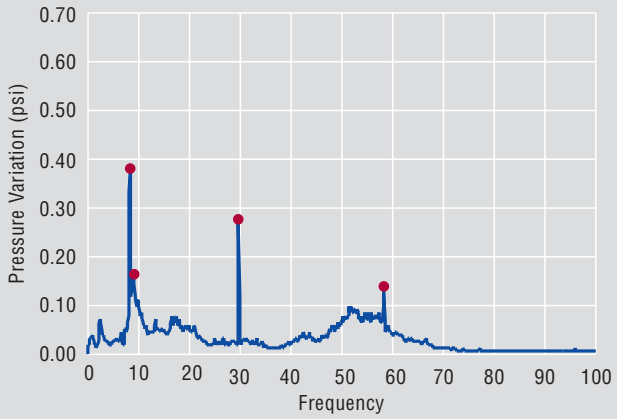
Norm Facey, Vice President of the Elk Falls operation, praised the Voith Process Solutions effort saying: *"They came in*

Fig. 1: *Pulsation example.*
Line Pressure 11.20 psi
Peak to Peak 3.11 psi
Overall Variation 27.7%

Fig. 2: *Approach Flow problems.*

Fig. 3: *Approach Flow modification.*

Peak List for Frequencies		Comments
0.379 psi at 8.375 Hz	=>	1x Fan Pump
0.167 psi at 9.000 Hz	=>	2x Screens
0.279 psi at 29.750 Hz	=>	2x Secondary Fan Pump
0.137 psi at 58.250 Hz	=>	7x Fan Pump



and found a problem we did not even know existed. We were able to reduce draw by 17 feet and got incredible runnability on the machine."

Stock Approach Flow System

A large LWC machine was experiencing severe machine directions and cross-machine-direction basis weight swings. The problem left the machine unable to meet customer specifications for the mill's most important product at an acceptable machine efficiency rate.

The Voith Process Solutions team conducted a complete analysis of the stock approach flow system including a pulsation study, engineering review of the piping flow characteristics, Tapio/TSO analysis, and headbox mapping. One of Process Solutions' Paper Process Engineers performed the pulsation study utilizing a multi-channel spectrum analyzer to assess the pressure variations at various points in the stock system **(Fig. 1)**.

This type of analysis can identify mixing problems, cavitation, and pulsations induced by rotating machinery as well as other flow related issues. Voith's paper testing laboratory tested finished paper samples to identify periodic variations in the sheet and fiber orientation. The study identified several areas in the approach flow system that were contributing to the basis weight instability being experienced on the machine **(Fig. 2)**.

The outcome of the analysis was a two stage approach that included changes to the existing approach flow piping system for short-term improvements as well as a redesign of the entire piping system as a capital project that would allow the machine to fully reach its expectations **(Fig. 3)**.

By implementing Voith's recommendations the mill was able to improve basis weight control significantly. This improvement allowed a reduction of 2 lbs. per 3300 sq. ft. in the basis weight target. Improved operational efficiency has resulted in additional savings for the mill.

2

3

Fig. 4: *Suction Roll modification.*

Fig. 5: *ProcessPlot.*

Cross Division Cooperation

One of North America's largest market pulp machines had been unable to achieve its design production goals due to water rejection in the second nip. After the mill and several suppliers had focused on trying to correct the problem through changes around the second press, the mill contracted Voith Process Solutions to address the problem.

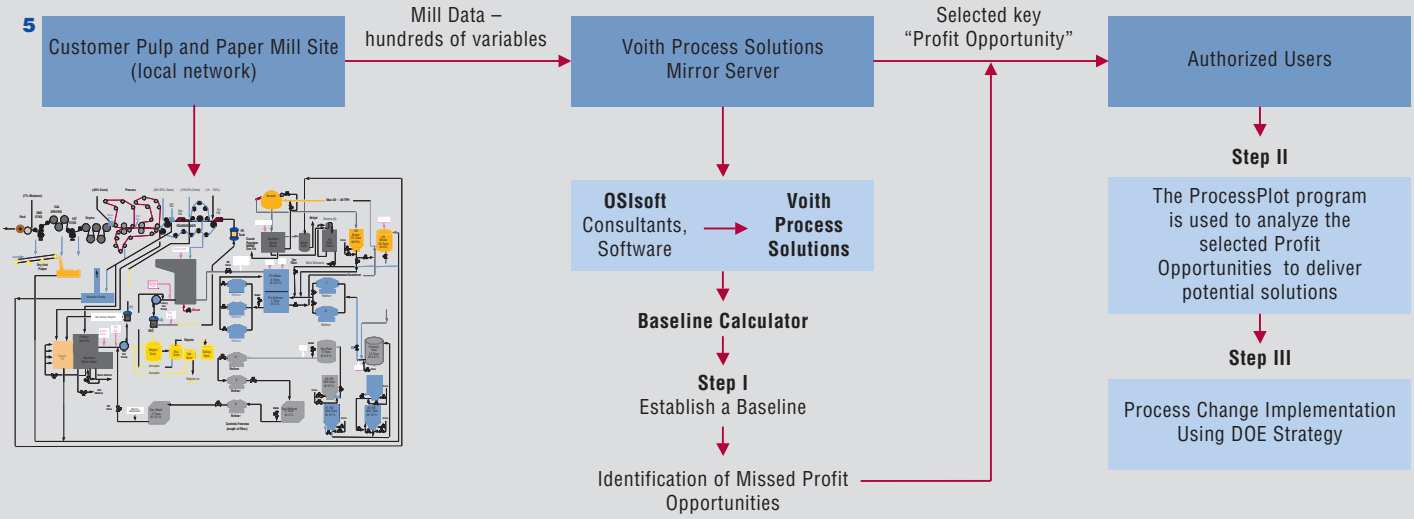
Through observation of machine operations and a series of diagnostic tests, the Process Solutions specialists concluded that the problem was due to inadequate water removal in the first press. Since the first press had already been optimized, Process Solutions made the recommendation of adding another high vacuum zone to the existing suction box. Working with the local Voith service center, a competitor's suction box was redesigned to improve performance (Fig. 4). The Springfield, Oregon Service Center carried out the modifications and the mill re-installed the roll in the machine.

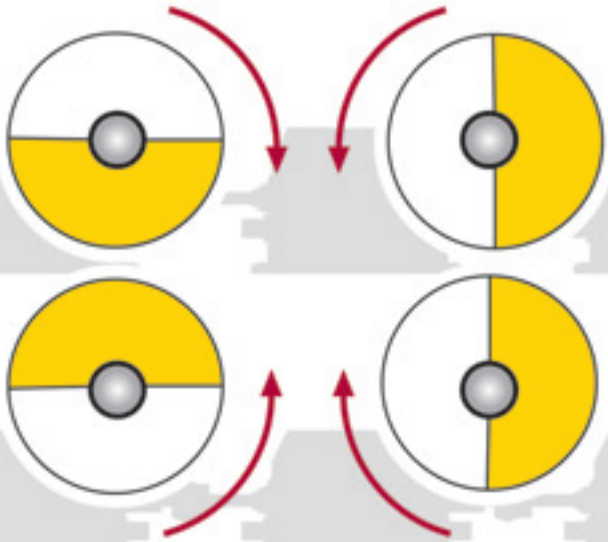
Since installation of the modified roll, the machine has increased speed by 300 fpm and is producing an additional 400 TPD. The mill has also had the suction box for the spare roll modified by Voith.

These examples and many others show the ways that Voith Process Solutions is working with our customers to improve productivity and quality over the life of the paper machine.

Innovative New Technologies

Voith Process Solutions is now introducing advanced diagnostic systems to further support customers in getting the most out of their equipment. Working with the leading experts in process information systems, Voith Process Solutions has developed the ProcessPlot system which allows us analyze data gathered through the paper mill's data historian and distributed control systems as never before (Fig. 5). With ProcessPlot, Voith Process Solutions can assess and quantify process control issues that had previously gone unnoticed. The unique value of ProcessPlot is to quantify economic opportunities on the machine and provide financial justification for recommended changes.





DuoShake – continues to be successful

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The DuoShake has proven its potential and superiority on 70 paper machines worldwide – in the meantime, from China through Europe to North and South America. This extends over the entire bandwidth from low-speed machines to high-speed machines running at 1,200 m/min as well as at basis weights from 18 g/m^2 to 550 g/m^2.

The advantage of the DuoShake over conventional shakes is mainly due to the fact that the DuoShake only transmits negligible centering and frictional forces to the foundation. Other shakes on the market do not have these advantages and support their shake rod force in the machine foundation. This means that extensive constructional measures are required to take up these forces. No special foundations are required for the DuoShake, except a steel base.

The operating principle of the DuoShake permits shake frequencies that are not achievable with any conventional shake. Through this, distinctly measurable improvements in formation can be reached even at very high machine speeds.

The shake characteristic number is calculated with the following formula:

$$\frac{\text{Frequency}^2 \times \text{stroke}}{\text{Machine speed}}$$

It has been found that, as a rule, the best results are reached at shake characteristic numbers from approx. 3,000 to 4,000. If a frequency of 280 strokes/minute and a stroke of 14 mm are now taken as a basis for a shake, this results, at a machine speed of v = 300 m/min, in a shake characteristic number of 3,659. However, if the machine speed is raised to v = 1,000 m/min, this results in a shake characteristic number of only 1,098, which has hardly any influence on formation.

With the DuoShake an excellent value at much higher shake frequencies is reached even at higher machine speeds. At a shake frequency of, for example,

Fig. 1: *Performance diagram – stroke.*

Fig. 2: *Performance diagram – shake characteristic number.*

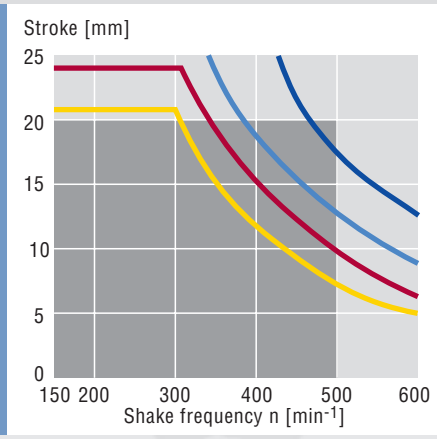
Shaken mass:
- *2,000 kg*
- *3,000 kg*
- *4,000 kg*
- *5,000 kg*

Drive moment: *150 Nm* *250 Nm.*

Fig. 3:
- *Coating base 1*
- *Coating base 2*
- *News*
- *Envelope*
- *Decor paper 1*
- *Decor paper 2*
- *Label*

Abb. 4: *DuoShake in use.*

1



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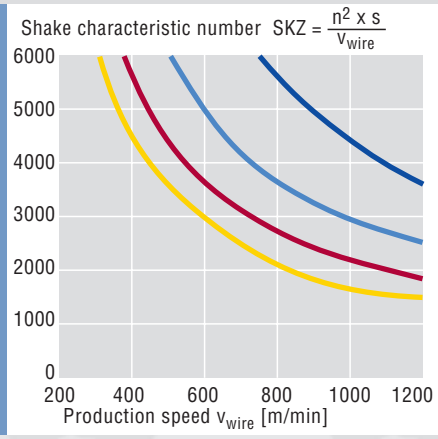

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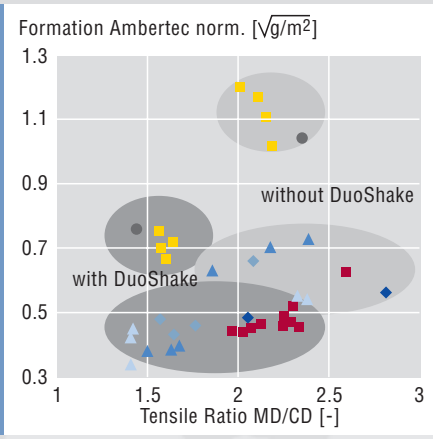

530 strokes/minute and a constant stroke of 14 mm, and at a machine speed of 1,000 m/min, a shake characteristic number of 3,933 is still achieved, of course without disturbing reaction forces.

The latest generation of the DuoShake is equipped with a hydrostatically supported carriage. This contributes considerably to the reduction of wear.

The technical principle

The DuoShake operates on the physical center-of-gravity principle. Several masses moved in a system maintain their common center of gravity. In a gear unit housing, masses are arranged in such a way that the mass center of gravity can move only in the breast roll axis. If the shake masses are rotating, the breast roll responds with a counter movement. The inertia forces remain in the moving system and are transmitted only via the shake rod.

The stroke length is determined by the addition of the shake mass forces. Adjustment is made by changing the angle between the rotating pairs of masses.

The performance diagram **(Figs. 1 and 2)** shows the operating range of the DuoShake taking into consideration the maximum rod force of 50 kN. Below the limit curves, any combination of stroke and frequency is possible.

As **Fig. 4** shows, the fact that the DuoShake generates no interfering forces of reaction makes it possible to install the DuoShake on the top-wire framing.

Evaluations made by many different customers have shown that, with the DuoShake, formation can be improved even at higher PM speeds thanks to the much higher shake characteristic numbers. In addition, the DuoShake reduces the tensile ratio l/q by up to 0.5, which is indispensable especially for good dimensional stability. The DuoShake is, therefore, an economic alternative for formation improvement and a must whenever a low tensile ratio l/q is required. In many cases it is even used in addition to a DuoFormer D in order to achieve optimal formation at a low tensile ratio l/q.

For trial purposes, a rental shake is always available at our Düren location, which can in most cases be used by the customer for tests at short notice. Before purchasing, each customer can test the effects on his machine and on his special products under simplified, but realistic conditions without great expense and can convince himself of the tremendous advantages and possibilities of the DuoShake.

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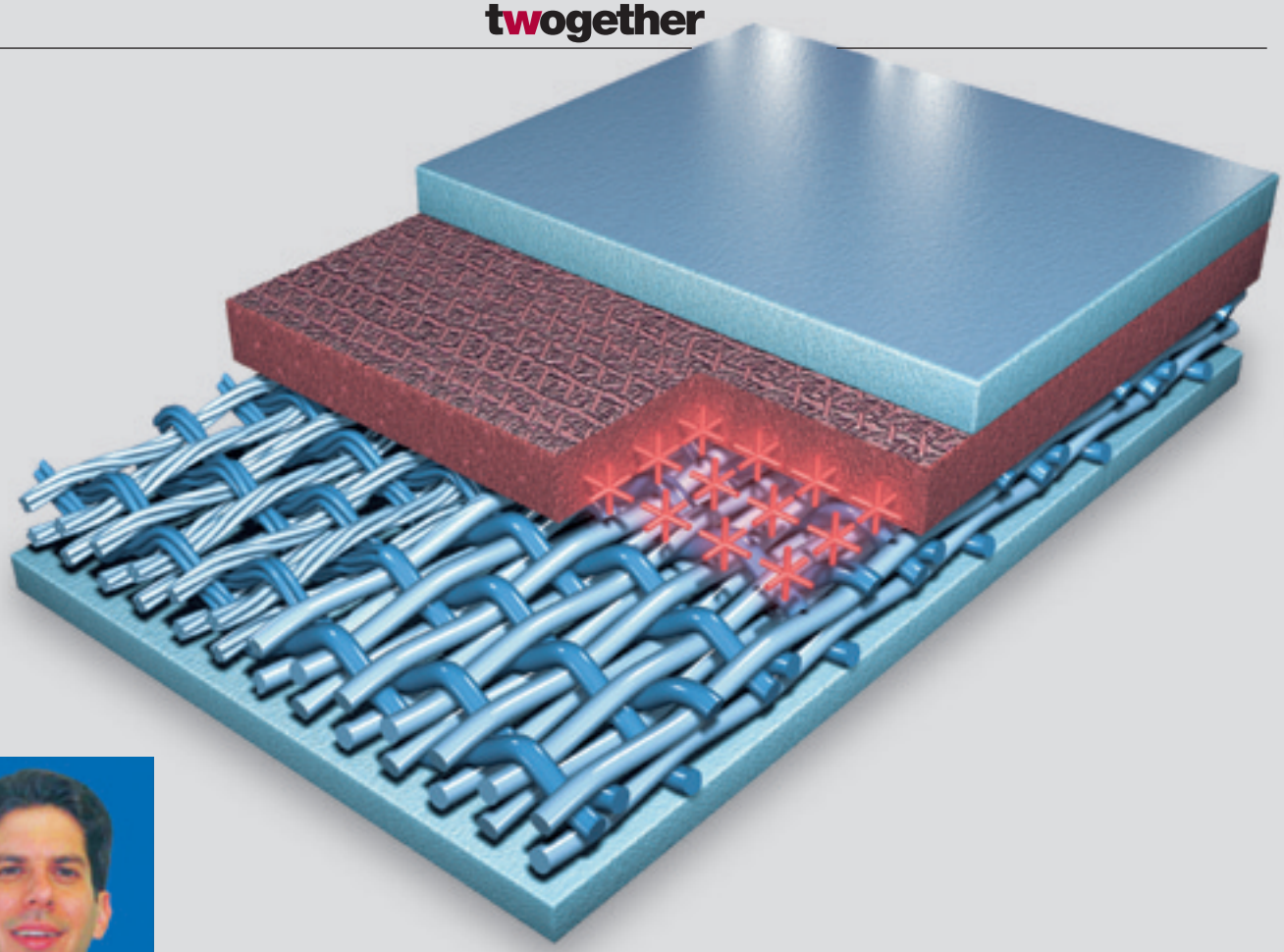

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Voith Fabrics' PrintFlex P – development of a new press fabric concept for improved surface uniformity and sheet dryness

Surface Uniformity

The surface characteristics of a press fabric are influenced by three main components: batt fiber size, the fiber locking process and the base cloth components used. By far the greatest impact comes from the batt fiber size. For graphic paper applications, batt fiber size will typically be in the range of 6.7 dtex (fine) – 44 dtex (coarse).

In general, the coarser fibers are used in the intermediate structure while the finer fibers are used on the surface to be in contact with the sheet. The finer fibers will have the greatest influence for providing a high 'pressing uniformity' for the press fabric.

In order to better understand and quantify press fabric surface uniformity, an evaluation method has been developed by Voith Fabrics. The testing method is based on a numerical analysis of compressed contact points of the press fabric. The two values of importance are the ASN (average size number) and the FIN (fiber indentation number).

The finer fibers offer great potential for providing a high uniformity, but they have a negative influence on the wear rate and porosity loss of a press fabric.

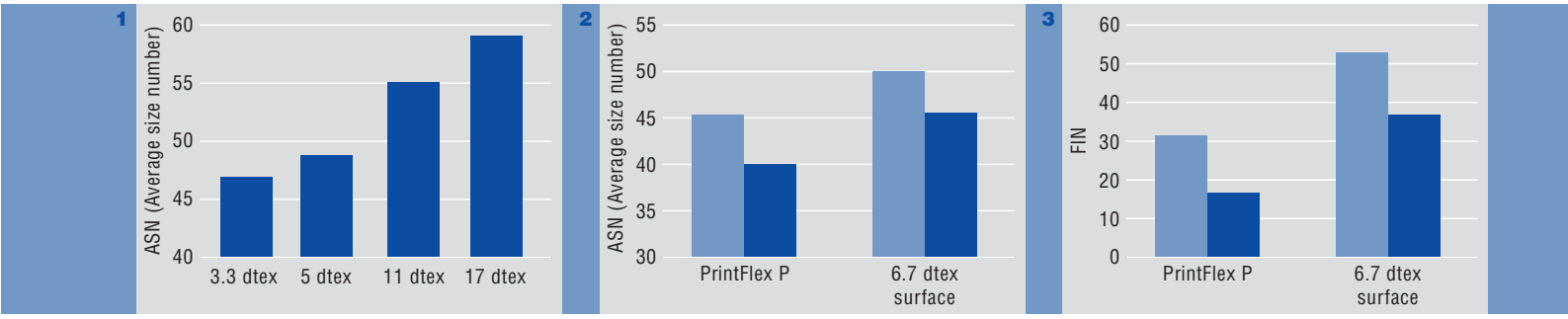
Fig. 1: *ASN for press fabrics with different surface properties.*

Fig. 2: *ASN index comparison for press fabrics having different surface properties.*
New
After running

Fig. 3: *FIN index comparison for press fabrics having different surface properties.*
New
After running

Fig. 4: *After press dryness results for different batt structures – VPM4.*

Fig. 5: *Permeability of press fabrics New – VPM4.*



PrintFlex P, forms stage 2 of Voith Fabrics '4-stage platform' for pressing. PrintFlex P is composed of a surface made of fine batt fiber, layered with engineered resin components. It provides an extremely high degree of pressing uniformity, with excellent wear resistance.

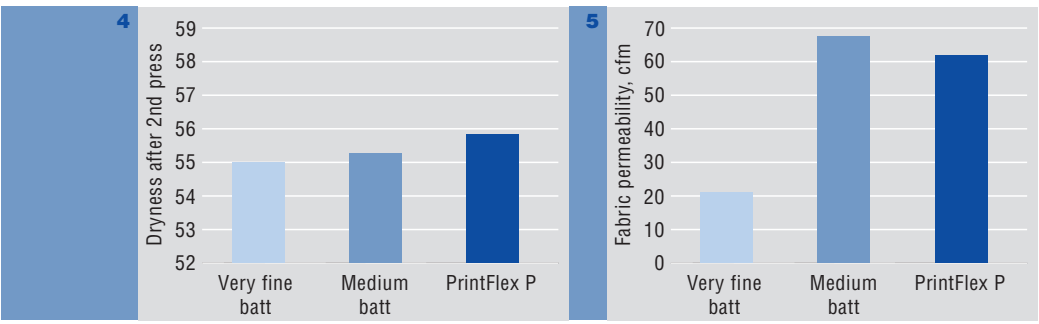
Figs. 2 and 3 show the comparison of results between a 'standard' press fabric, with a fine 6.7 dtex surface, and PrintFlex P.

It can be observed that the PrintFlex P has an ASN number almost 10 % lower than the 'standard' fabric. The FIN index, shows over 40 % improvement for PrintFlex P over the 'standard' fabric surface.

Figs. 2 and 3 show the comparison of ASN and FIN between new and used fabric.

Analysis of the fabric permeabilities showed that the PrintFlex P retained over 33 % of more of its original permeability after use, compared to the 'standard' design. It is important to also note that despite the application of the engineered resin components, the PrintFlex P design was manufactured to the same level of starting permeability as the 'standard' design.

Mechanical abrasion tests have also demonstrated the high wear resistant properties of PrintFlex P. Again, compared to the 'standard' design, PrintFlex P gave almost 10 % less weight loss. The benefits of this can be seen from the case study shown in Fig. 9.



Dryness/Rewet

Initial evaluations of PrintFlex P were carried out on the VPM4 pilot machine in Heidenheim, Germany, to investigate the influence of fabric surface properties on sheet dryness and sheet quality. An SC magazine furnish was used for the tests. Three different sets of press fabrics having different surface properties were tested: a 'fine' (3.3 dtex), 'coarse' (17 dtex) and PrintFlex P.

Dryness values were taken after the second press (Fig. 4). PrintFlex P provided the highest dryness values of over 55 %.

Another important aspect to consider is the permeability of the press fabrics. The PrintFlex P had a permeability of 58 cfm, the 'medium batt' fabric 63 cfm, whilst the 'very fine' fabric only 18 cfm (Fig. 5).

Fig. 6: *Base paper PPS roughness results – VPM4.*

Fig. 7: *SC Paper PPS roughness results – VPM4.*

Fig. 8: *Missing dots (%) – VPM4.*

Fig. 9-12: *PrintFlex demonstrates superior printability compared to standard press fabric.*

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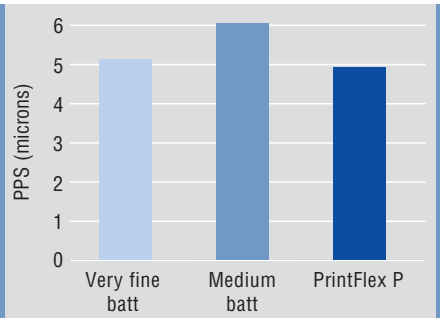

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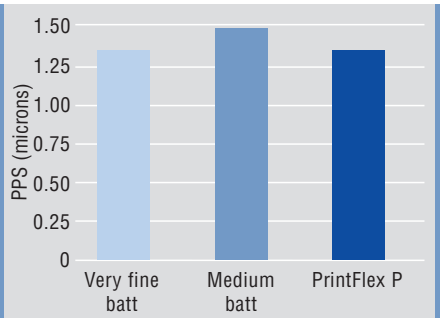

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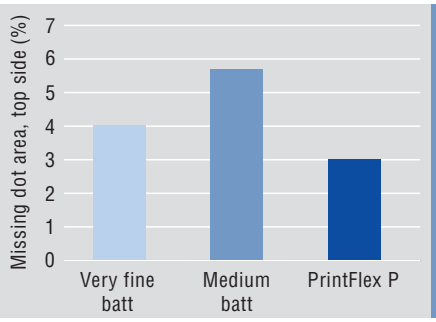

Sheet Quality

Depending on the application, the surface characteristics of the press fabric can have a variable degree of influence on paper properties. In shoe press systems, a long-nip residence time will positively affect dewatering dynamics, but can also generate some negative sheet quality issues. The effect of the press fabric surface properties on paper quality has gained a lot of attention in recent years, especially with single- and tandem-shoe press configurations.

It is also important to investigate the influence of the fabric properties beyond to the end user. Finished paper quality issues, such as missing dots, can often be linked to the surface characteristics of the press fabrics used. Base and finished sheet properties were evaluated during the pilot machine trials. PrintFlex P gave improved PPS results for both the base and finished paper **(Figs. 6 and 7)**. The results also confirmed the clear correlation between the press fabric surface characteristics and paper smoothness.

Understanding the influence of the press fabric on finished paper properties has become an essential segment of Voith Fabrics' continued research and development work.

The paper was then submitted for missing dots evaluation **(Fig. 8)**. As expected, the 'medium batt' fabric had the highest area of missing dots. PrintFlex P gave an improvement of over 30 % against this, with measurable benefits also seen against the 'very fine' fabric.

From a comparison of standard press fabrics and PrintFlex P **(Fig. 9)**, results taken from paper made in commercial trials has confirmed that a reduced fiber impression within the press nip **(Fig. 10)**, contributes directly to a smoother sheet surface profile **(Fig. 11)** and a significant improvement in measured printability **(Fig. 12)**.

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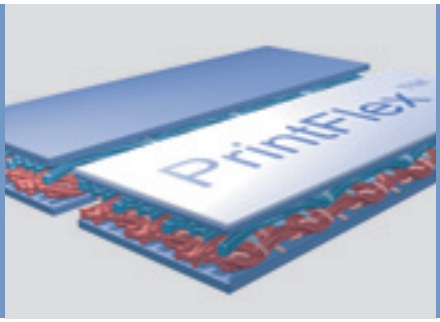

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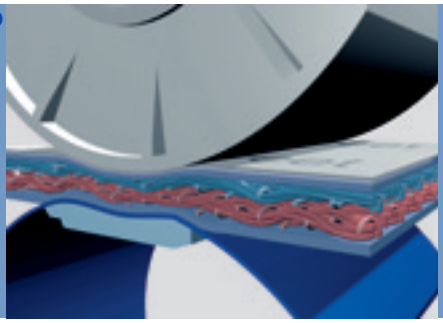

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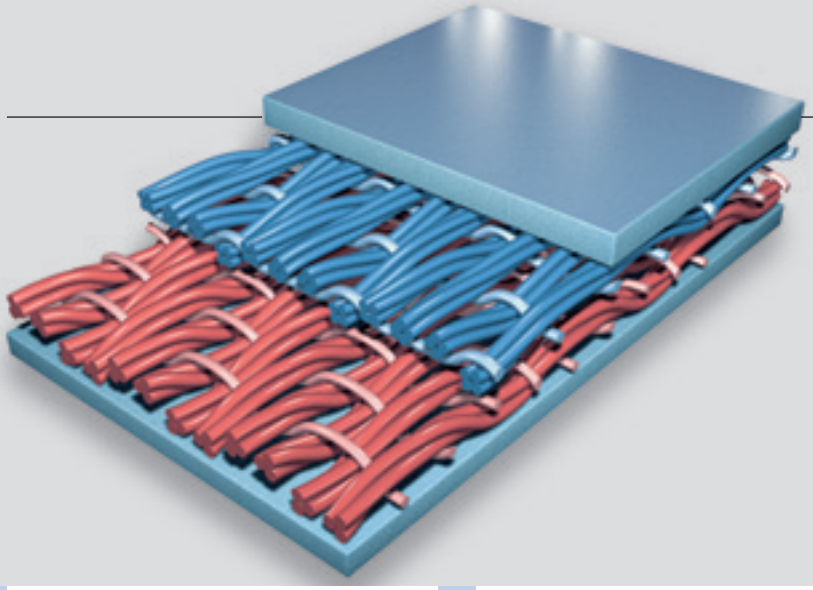


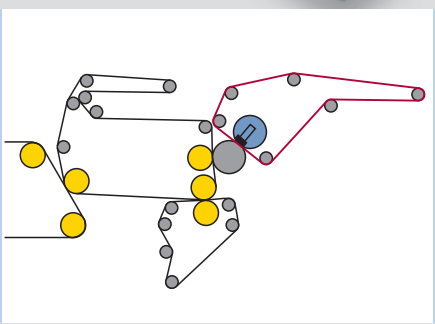
CS I: *Press fabric wear improvement on graphic paper application.*

CS II: *Sheet smoothness improvement on fine paper application.*

CS III: *Sheet smoothness improvement on linerboard application.*

Fig. 13: *Press Fabric incorporating PrintFlex technology.*

I



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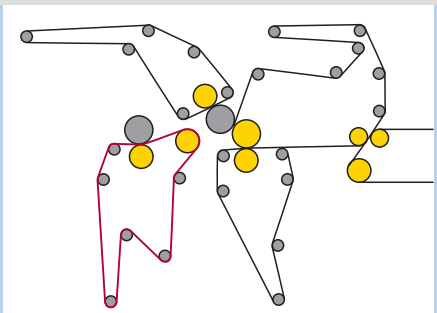

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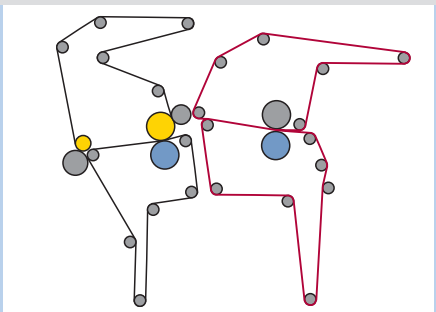

Case Study I

PrintFlex P press fabric graphic paper application

1,700 m/min, 100 % recycled newsprint, 3rd press (shoe press).

- Improved wear resistance. Weight loss reduced by 43.5 % when compared to standard structures.
- Consistent water removal throughout life.
- Standard design on this position.

Case Study II

PrintFlex P press fabric graphic paper application

1,050 m/min, fine paper, 4th press.

- Improved sheet smoothness by 26 % when compared to standard structure (new).
- Improved sheet smoothness by 6 % when compared to standard structure (after mid life).
- Translates into significant reduction in two-sidedness.

Case Study III

PrintFlex P press fabric board and packaging application

675 m/min, linerboard, 3rd top/3rd bottom LNP 315 kN/m.

- Improved sheet smoothness (Emveco) by 24 %.
- Speed increase without maximizing steam.

Conclusion

As demonstrated, technologically advanced press fabric systems are truly capable of facing the challenges imposed by modern paper making in terms of efficiency and quality.

The test results indicate that PrintFlex P can be used effectively as an important tool to improve sheet properties and wear resistance.

The findings also open the door for further research and development work in the area of press fabric surface uniformity using resin based components.

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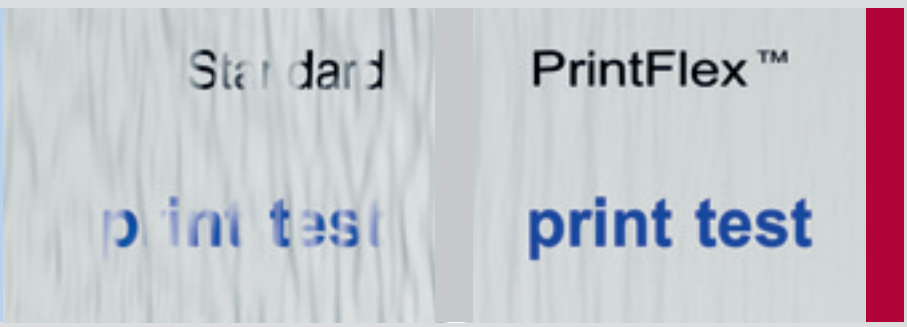

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Japanese Paper Blossoms Anew

Once upon a time there was a beautiful princess ... Japanese legends usually start that way too. The princess descended from heaven and taught the Japanese people in the Kansai region the art of Washi making. Very soon it turned out that it was the Goddess of Paper herself who had chosen this method of introducing "Wa Shi" – literally translated "Japanese Paper" – to the world. Until this very day, Washi has remained a legendary paper in the true sense of the word. It is as much part of the Western world's traditional image of Japan as Geisha, Samurai and Harakiri.

However, the craft that celebrates this one thousand five hundred year old legend is threatened with extinction. In the craft workshops it is almost always old people that one sees working the bamboo skimming screens. Many of the best papermakers, honoured and promoted by the government as "living art treasures", have already reached the age of 80 or beyond. So far, the business acumen of a few enthusiasts has saved this tradition from vanishing completely, and, at the moment, Japan is even undergoing a distinct Washi renaissance.

Japanese paper is a much sought-after product, particularly because of its high quality. German book illustrator Veronika Schäpers, who studied the art of papermaking for some years in Japan, explains:
"No chemical additives are used in the production process. In traditional European rag paper the fibres are short and thick, whereas in Japanese Washi paper they are long and thin. The papermakers can thus produce outstandingly strong, tear-resistant paper." In addition, a different skimming process is used. The fibres are arranged more uniformly in one direction and the paper's surface is smoother.

Top-quality Washi is very popular among artists, particularly book printers, lithographers and painters. The Japanese wood engraver Katsushika Hokusai acquired world fame with his Washi Paper prints of mount Fuji. The Hamburg artist Horst Janssen too, whom experts have extolled as the "Albrecht Dürer of the 20th century", also preferred to use high-quality paper from Japan for his masterpieces.

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Fig. 1: *Boiling vessel: Kozo branches are steamed over boiling water to make the bark easier to remove.*

Fig. 2: *Soaking the fibre strands in river water.*

Fig. 3: *Dried fibres in front of a farmhouse.*

Fig. 4: *Peasant women at work with a bamboo screen.*

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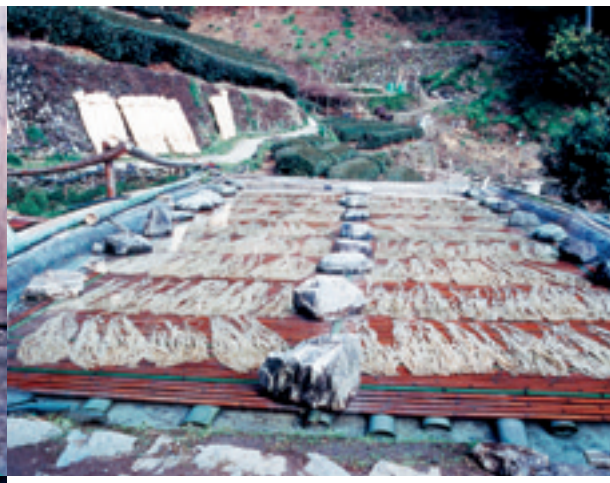

Making Washi involves a lot of time and effort – and is, as a consequence, very expensive. The best fibres are extracted from the inner bark of the mulberry tree (Japanese Kozo), Gampi plants and the Mitsumata bush. The branches are collected in the winter, after the leaves have fallen, and are then sawn into 1 metre long sections and steamed above large vessels filled with boiling water. The bark is removed and soaked in water for one day, contaminants are separated off and the white fibres are dried. To make them soft, they are soaked in water again for many hours and later boiled with potash. After washing out the lye, the last dark pinholes are separated from the fibres – a task that is entrusted in Japan to female workers.

The fibre strands are then spread out on a cherrywood board and beaten with a broad wooden stick. After another washing phase the purified fibres are stirred into water and sheets of paper are scooped out one by one with the aid of bamboo screens. Only the skilled craftsman has the knack of plunging the screen

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repeatedly into the paper suspension in a particular rhythm, so that the fibres are distributed uniformly.

One of the secrets of Washi production is adding Neri to the paste. This viscous root sap from the Japanese hibiscus plant links the paper fibres together, improves sheet formation and permits wet sheets to be stacked. The sheets are dried by pressing and then individually brushed on to Gingko wood boards. During the drying process it is this wood that gives paper its special gloss, an effect that becomes stronger as the paper ages. Washi is never bleached unless by exposure to natural sunlight. The fibres get their colour solely from the washing and cleaning processes.

Papermaking by this method is a burdensome task. Those involved have to work in a constant stooped or standing position for many hours with their hands in icy water. To master each step in the process, budding papermakers need four to six years of training. Although wholesalers have to pay as much as 80 Euro for one single sheet of this paper, the employees hardly ever earn more than 8 Euro per hour. This is one of the reasons why traditional Japanese small-scale craft trades have had difficulty for some years in recruiting young people – despite a lot of advertising for this profession through job centres and the visits to schools by master papermakers, and despite exhibitions in museums and even theme parks on the subject of papermaking.

In many regions the traditional papermakers have had to become highly specialized in order to outperform industrial products and locate market niches. In the Gifu Prefecture, for example, the emphasis is on “Amime” paper: This network-style Washi is created by water jets perforating the fibres on the bamboo screen. This paper is mainly used for decorative purposes.

Hosho paper is particularly thick and soft. In the Echizen region this grade was used to produce Japan’s first national paper money, because it does not shrink and is resistant to tearing. Nowadays it is mainly used for wood etchings. Several famous painters, for example Taikan Yokoyama, order large-format Washi sheets from Echizen. They use them for Sumi-e (watercolour paintings) and calligraphy. The museum in Imadate, which is also located in the Echizen region, contains the world’s largest hand-skimmed sheet of paper: 7.1 x 4.3 meters – over 30 square metres of Washi in a single piece.

Of course, it was not a Goddess but Korean monks who took the art of papermaking to Japan. The Japanese Emperors invited the first monks over from the Korean peninsula in the 5th century, because they wished to distribute Buddha’s transcripts on paper all over the country. The common people were encouraged to grow mulberry trees to ensure an adequate supply of raw material. In the eighth century the Japanese began to refine the Korean technology when they discovered Gampi as a raw material, a plant indigenous to Japan. Gampi fibres are noted for their exceptional fineness and natural viscosity. With the aid of this

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Fig. 5: *Bundled Washi paper.*

Fig. 6: *The fibre strands are spread on a cherrywood board.*

Fig. 7: *A papermaker skimming off a paper sheet with a bamboo screen.*

Fig. 8: *Finishing Washi paper with plant dyes.*

Fig. 9: *Ibe-Washi.*

material, Japan's own paper culture began to thrive and shook off the once predominant Chinese and Korean influence.

During the Heian period (794-1185) a large paper mill was established in Kyoto, then the Imperial capital of Japan, to make paper for public use. The paper mill also dyed paper and trained papermakers, so that the craft spread rapidly all over the country. With its abundant forests and clear mountain streams, the Japanese environment was extremely suitable for the production of top-quality paper. Very soon Washi was also used for correspondence, keeping records, Zen poetry (Japanese Haiku) and wood engravings. In the 17th century Japan's strong but flexible and translucent paper started to penetrate many aspects of daily life: Washi was used to cover the sliding walls of Tatami rooms, and also for lampshades, umbrellas, bags, flags, masks and blinds.

At a very early stage, paper was used as a ritual material in numerous Shinto and

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Buddhist religious ceremonies. It became the symbol of purity and a spiritual meaning was attributed to it. Even today in Japan, paper ornaments and strips are regarded as the bearers of glad tidings. They often flutter on shrines and temples. The art of paper folding (Origami) was also born at this time.

During the Edo period (1603-1868) farmers had to pay tribute to their feudal lords in the form of rice in the summer and paper in the winter. The aristocrats used such paper for private correspondence but also as toilet paper. Paper used by the farmers for their own purposes was impregnated with the sap of the Khaki plant to make waterproof shoes and rain capes for field work.

Until recently papermaking was still a secondary occupation for some Japanese peasant farmers. Of course, their sheets were not as perfect as those produced by professional papermakers, but it was these little flaws in particular that gave their paper a special charm. It is uneven and far from smooth, and its fibres of varying thickness make it a distinct natural product with an "ecological touch".

In the 1980s, the Japanese Naoaki Sakamoto came up with the idea to revive this rural tradition of papermaking. In remote villages he found several farmers who used to skim off paper by hand. Some had still kept their original equipment, including very old screens, in the attic. A genuine stroke of luck: Sakamoto, in Tokyo known as "Paper Nao", was able to convince such farmers to make "ordinary" Washi paper for him. On the island of Shikoku, for example, there lived an old couple whose families had made Senkashi paper for many generations. The Korean Buddhist Senka had brought this craft to Japan, and it is one of the most original Japanese papers of all. Although also produced in other regions of Japan, its thickness, shape and colour had gradually changed. Only this one remaining old couple still knew how genuine Senkashi paper should look and how to make it.

Nao finishes the farmers' Washi with natural plant dyes applied to the paper with broad paintbrush strokes. Interior decorators like to use this Washi grade as a luxury tapestry or wall decor in the designer restaurants of Tokyo and Osaka, where the atmosphere has to accord with the perfect presentation of the meal. A large Washi sheet dyed by hand can easily cost 150 Euro.

However, this high price is not a deterrent to many Japanese customers, because in the past 10 years Japan has become more conscious of its origins. The reason: while catching up with and even outperforming Western industrial economies, Japan tended to neglect its own roots. The recession that followed the stock exchange crash in 1991 triggered off a resurgence of old traditions and values. Japanese handicraft has now become one of these much sought-after values, a trend that has helped Japanese Washi to experience a new, if modest boom.

Martin Fritz

Photos: Naoaki Sakamoto, Tokyo

HIGHLIGHTS

Startup highlights in 2002/2003

Fiber Systems

Stock preparation systems and sub-systems for graphic papers
Hindustan Newsprint, Kerala, India.
Chadha Papers, Bilaspur, India.
Murli Agro Papers, Nagpur, India.
Paper Corea, Kunsan, Korea.
Mudanjiang Hengfeng Paper, Hengfeng, China.
Shandong Huatai Paper, Huatai, China.
Stora Enso, Langerbrugge, Belgium.
UPM Shotton, Shotton, United Kingdom.
UPM Schongau, Schongau, Germany.
Minfeng Special Paper, Minfeng, China.
Ripasa, Americana, Brazil.
Daishowa America, Pt. Angeles, USA.
Bear Island, Ashland, Canada.
Bowater, Catawba, USA.
Abitibi-Consolidated, Alma, Canada.
UPM-Kymmene, Miramichi, Canada.
Abitibi-Consolidated, Baie Comeau, Canada.
Ponderay Newsprint, Usk, USA.

Stock preparation systems and sub-systems for board and packaging papers
SCA Packaging Switzerland, Oftringen, Switzerland.
Kappa Kraftliner, Loevholmen, Sweden.
Wuxi Long Chen Paper, Jiangsu, China.
PCE, Manaus, Brazil.
Adami, Cacador, Brazil.
Shandong Bohui Industrial, Bohui, China.
Thai Kraft, Wangsala, Thailand.
United Pulp and Paper, Calumpit, Philippines.
PCA, Tomahawk, USA.
Weyerhaeuser, Springfield, USA.

Stock preparation systems and sub-systems for tissue papers
Sepac, Mallet, Brazil.
Kimberly-Clark, Lima, Peru.
Georgia-Pacific, Muskogee, USA.
Canoinhas, Canoinhas, Brazil.

Paper machines

Graphic papers
Shandong Huatai Paper Group, Shandong, China.
Minfeng Special Paper, Jiaxing, China.
Mudanjiang Hengfeng Paper Group, Henfeng, China.
Calik Group Turkmenistan, Yaslik, Turkmenistan.
Sichuan Jinfeng Spike Paper Products, Chengdu, China.
Security Papers, Karachi, Pakistan.

Board and packaging papers
Shandong Bohui Papermaking Group, China.
Ibema-Cia Brasileira de Papel, Turvo Mill, Brazil.

Tissue
Guangxi Guitang Group, Guigang TM 1, China.
Guangxi Guitang Group, Guigang TM 2, China.
Kriepa Hygienepapier, Kriebethal, Germany.
SCA Tissue North America, Barton, USA.

Installation and rebuilds
UPM Shotton Paper Company, Shotton, United Kingdom.
Neusiedler-SCP, Ruzomberok Mill, Slovakia.
Stora Enso, Veitsiluoto Mill, Kemi, Finland.
Stora Enso, Kotka Mill, Finland.
Tamil Nadu Newsprint and Papers, Tamil Nadu, India.
Holmen Paper, Braviken Paper Mill, Sweden.
Papierfabrik Palm, Eltmann Mill, Germany.
SCA Graphic Sundsvall, Ortviken Paper Mill, Sweden.
UPM-Kymmene Group, Rauma Mill, Finland.
Stora Enso Publication Paper, Kabel Mill, Germany.
UPM-Kymmene Papier, Schwedt Mill, Germany.
Solikamskbumprom Solikamsk, Russia.
Lecta, Usine de Condat Le Lardin, France.
Sappi Ehingen, Germany.
Stora Enso North America, Duluth Mill, USA.
Bowater, Catawba Mill, USA.
Myllikoski, Ettringen Mill, Germany.
Lecta (Torraspapel), Fabrica Motril, Spain.
Norske Skog Tasman, Kawerau, New Zealand.
Neusiedler, Dunjavaros Mill, Hungary.
Neusiedler, Kematen Mill, Austria.
Stora Enso North America, Kimberly Mill, USA.
Stora Enso North America, Biron Mill, USA.
Bear Island Paper, Ashland, USA.
Bowater, Catawba, USA.
Kishu Paper, Japan.
Nippon Paper, Komatsushima Mill, Japan.
Nippon Paper, Shiraoi Mill, Japan.
Tokiwa Paper, Owariasahi, Japan.
Kaysersberg Packaging, Kunheim, France.
SAPPI, Tugela Mill, Mandeni, South Africa.
Kappa Zülpich Papier, Zülpich, Germany.
Mayr-Melnhof, Neuss, Germany.
ABB Figeholm, Figeholm, Sweden.
Shindaeyang Paper, Ansan Mill, Korea.
Korea Export Packing Industrial, Pusan, Korea.
Koa Kogyo, Fuji, Japan.
Nippon Paperboard, Soka Mill, Japan.
Hokuyo Paper, Eniwa, Japan.
Adami, Cascador Mill, Brazil.
Inpa-Ind. De Embalagens Santana, Pirapetinga, Brazil.
Papel Caisas e Embalagens/PCE, Amazonas, Brazil.
MD Papéis, São Paulo, Brazil.
Ripasa Americana, São Paulo, Brazil.
Riau Andalan Pulp & Paper, Kerinci, Indonesia.
Owens Corning Veil Netherlands, Apeldoorn, Netherlands.
Papierfabrik Wattens, Wattens, Austria.
Papierfabrik Schoeller & Hoesch, Gernsbach, Germany.
Security Paper Printing & Minting Corporation Davlat Belgisi, Tashkent, Uzbekistan.
Radece papir, Radece, Slovenia.
Arjo Wiggins, Fort William Mill, United Kingdom.
Crane, Tumba, Sweden.
Neusiedler Ybbstal, Kematen, Austria.
Neusiedler Szolnok Papirgyar, Dunaujvaros, Hungary.
Ahlstrom Osnabrück, Osnabrück, Germany.
OP papirna, Czech Republic.

HIGHLIGHTS

Dresden Papier, Heidenau, Germany.
AO Solikamskbumprom, Russia.
Norske Skogindustrier, Saubrugs, Norway.
Haindl Papier, Schwedt, Germany.
Hansol, Korea.
Mundanjiang Henfeng Paper Group, China.
Cartiere Sarego Valchiampo, Italy.
W. Hamburger, Pitten, Austria.
Mondialcarta, Lucca, Italy.
Cartiera di Cadidavid, Italy.
Cartiera di Ferrara, Italy.
Cartiera di Tolentino, Italy.
Papelera de la Alqueria, Alqueria de Aznar(Alicante), Spain.
Assi Domain, Frövi, Sweden.
Kartonfabrik Buchmann, Rinnthal, Germany.
Indústria de Comércio de Papeis e Plástico/Citroplast; São Paulo, Brazil.
Oji Paper, Saga, Japan.
Oji Board, Nayoro PM3, Japan.
Papresa, Renteria, Spain.
Zanders Feinpapiere, Bergisch-Gladbach, Germany.
Papirnica Vevce, Ljubljana, Slovenia.
VPH Veiligheitspapierfabriek, Ugchelen, Netherlands.
Papierfabrik Louisenthal, Gmund, Germany.
Zhejiang Papermaking Research Institute, Hangzhou, China.
Papeles Norske Skog Bio Bio PM1, Concepción, Chile.
Bahia Sul Celulose, Mucuri, Brazil.
Votorantim Celulose e Papel PM2, Jacareí, Brazil.
Votorantim Celulose e Papel, Piracicaba, Brazil.
Cia. Suzano de Papel e Celulose PM8, Suzano, Brazil.
PCE – Papel, Caixas e Embalagem, Manaus, Brazil.
Citroplast Ind. E Com de Papéis e Plásticos, Andradina, Brazil.
Amcor Cartonboard, Petrie, Australia.
Cia. Suzano de Papel e Celulose PM 6, Suzano, Brazil.
Papeles Industriales, Santiago, Chile.
Klabin Kimberly PM 4, Mogi das Cruzes, Brazil.

Coating technology
Minfeng Special Paper, Jiaxing, China.
Mudanjiang Hengfeng Paper Group, Hengfeng, China.
Calik Group Turkestan, Yaslik, Turkestan.
Neusiedler, Ruzomberok Mill, Slovakia.
Stora Enso, Veitsiluoto Mill, Kemi, Finland.
Stora Enso, Kotka Mill, Finland.
Tamil Nadu Newsprint and Papers, Tamil Nadu, India.
Lecta, Usine de Condat Le Lardin, France.
Bowater, Catawba Mill, USA.
Lecta (Torraspapel), Fabrica Motril, Spain.
Arjo Wiggins Papiers Couchés, Usine de Bessé-sur-Braye, France.
Gruppo Marchi, Toscolano, Italy.
Nippon Paper, Ishinomaki Mill, Japan.
Hokuetsu Paper, Ichikawa Mill, Japan.
Usine de Condat, Le Lardin, France.
Hansol, Korea.
Jinfeng PM 3, China.
Shandong Bohui Industry, Huatai, China.
Mitsubishi Paper, Japan.

Winding technology
Shandong Huatai Paper Group, Shandong, China.
Neusiedler-SCP, Ruzomberok Mill, Slovakia.
Stora Enso, Veitsiluoto Mill, Kemi, Finland.
Sappi, Ehingen, Germany.
Bowater, Catawba Mill, USA.
M-real Zanders, Werk Gohrsmühle, Bergisch Gladbach, Germany.
Papresa, Renteria, Spain.
W. Hamburger, Pitten, Austria.

Finishing

Janus Concept
Bowater, Catawba Mill, USA.

Ecosoft calender
Ibema-Cia Brasileira de Papel, Turvo Mill, Brazil.
Ripasa Cellulose e Papel, Ripasa, Brazil (2).
Shandong Huatai Paper Paper Group, Shandong, China.
Shandong Bohui Papermaking Group, China.
Stora Enso, Kotka Mill, Finland.
Stora Enso, Veitsiluoto Mill, Kemi, Finland.
Minfeng Special Paper, Jiaxing, China.
Neusiedler-SCP, Ruzomberok Mill, Slovakia.
Papeteries des Vosges, France.
Shenzhen Wander Color Printing & Packaging, China.
GAP Insaat Yatirim ve Disticaret, Turkestan.

NipcoFlex calender
Stora Enso, Baienfurt, Germany.

Calenders
Bowater, Catawba Mill, USA.
Neusiedler-SCP, Ruzomberok Mill, Slovakia.
Stora Enso, Kotka Mill, Finland.
Minfeng Special Paper, Jiaxing, China.
Shandong Bohui Papermaking Group, China.
Maanshan Paper Mill, Maanshan, China.
Ibema-Cia Brasileira de Papel, Turvo Mill, Brazil.
Zhejiang Yongtai Paper, Fuyang, China.
Cartiera di Carbonera, Italy.
Kishu Paper, Osaka CM 1, Japan.
Chung Loong, China.
Huatai, China.

Twister/Roll Handling
Shandong Huatai Paper Group, Shandong, China.

Roll cutting machines
Gojo Paper, Fuji, Japan.
StoraEnso, Veitsiluoto Mill, Kemi, Finland.
Shandong Bohui Papermaking Group, China.
Sichuan Jinfeng Innovation Industry, Taiwan.
Smurfit, Papeterie de la Seine, Nanterre, France.
W. Hamburger, Pitten, Austria.
Minfeng Special Paper, Jiaxing, China.
Neusiedler-SCP, Ruzomberok Mill, Slovakia.
Cartiere del Polesine, Italy.
Shandong Huatai Paper, Paper Group, Shandong, China (2).
Ripasa Cellulose e Papel, Brazil.
Chung Loong, China.
Sichuan Jinfeng Innovation Industry, China.
GAP Insaat Yatirim ve Disticaret, Turkestan.

Recent large orders

Fiber Systems

Stock preparation systems and sub-systems for graphic papers
LEIPA Georg Leinfelder, Schwedt, Germany.
Stora Enso, Maxau, Germany.
Feinpapierfabrik Dr. Franz Feurstein, Traun, Austria.
Stora Enso, Veitsiluoto, Finland.
Neusiedler-SCP, Ruzomberok, Slovakia.
VIPAP VIDEM KRSKO, Krsko, Slovenia.
Papresa, Renteria, Spanien.
Suzano de Papel e Celulose (B8), Suzano, Brazil.
Suzano de Papel e Celulose (B6), Suzano, Brazil.
Gold East Paper, Dagang, China.
Steinbeis Temming Papier, Glückstadt, Germany.
Hebei Pan Asia Long-Teng Paper, Shitaxilu, China.
Renova, Spain.
Stora Enso North America, Port Hawkesbury, Canada.
Daishowa Paper Mfg., Port Angeles, USA.
Abitibi-Consolidated, Alma, Canada.
Great Lakes Pulp, Menominee, USA.
UPM- Kymmene, Miramichi, Canada.
Abitibi-Consolidated, Alma, Canada.

Stock preparation systems and sub-systems for board and packaging papers
Emin Leydier, Nogent-sur-Seine, France.
Cheng Loong Corp., Shanghai, China.
Cheng Loong Corp., Ta Yuan, Taiwan.
W. Hamburger, Pitten, Austria.
W. Hamburger, Spremberg, Germany.
SCA Packaging Switzerland, Oftringen, Switzerland.
Changjiang Paper, Jiangjin, China.
SCA Packaging Munksund, Pitea, Sweden.
Companhia de Celulose e Papel do Parana, Curitiba, Brazil.
Conpel, Paraiba, Brazil.
Klabin, Guamipirim, Brazil.
Citroplast, Andradina, Brazil.
Irani, Vargem Bonita, Brazil.
AZBK Arkhangelskiy Zellyulozno-Bumazhny, Novodvinsk, Russia.
Ningbo Chonghua Paper Corp., Zhejiang, China.
Papier- und Kartonfabrik Varel, Varel, Germany.
Adolf Jass Schwarza, Schwarza, Germany.
PCA, Tomahawk, USA.

Stock preparation systems and sub-systems for tissue papers
Georgia-Pacific, Clatskanie, USA.
J.D. Irving, Saint John, Canada.

Paper machines

Graphic papers
LEIPA Georg Leinfelder, Schwedt, Germany.
Stora Enso Magazine Paper, Maxau Wolfsheck Mill, Germany.
N.N., China.
N.N., China.
Feinpapierfabrik Dr. Franz Feuerstein, Traun, Austria.
Papresa, Renteria, Spain.
Shandong Binzhou Filter Paper Industry, Binzhou, China.

Board and packaging papers
Shanghai Cheng Loong Corporation, Shanghai, China.
Papier- u. Kartonfabrik Varel, Varel, Germany.
Emin Leydier, Nogent-sur Seine, France.
Papierfabrik Adolf Jass, Rudolstadt-Schwarza, Germany.

Tissue
Swedish Tissue, Kisa, Sweden.

Dewatering machine
Jiang Lin, China.
Veracel Celulose Eunápolis, Bahia, Brazil.

Installation and rebuilds
Holmen Paper, Braviken Paper Mill, PM 52, Sweden.
Krkonosske Papirny, Hostinne, Czech Republic.
Olsanske Papirny, Olsany, Czech Republic.
Holmen Paper, Braviken Paper Mill (PM 51), Sweden.
Crown Van Gelder, Velsen, Netherlands.
Panasia, Mentakab, Malaysia.
Papierfabrik August Köhler, Oberkirch, Germany.
Abitibi Consolidated, Alma, Canada.
N.N., MI, USA.
Arkhangelsk Pulp and Paper Mill (APPM), Russia.
Stora Enso Packaging Boards, Baienfurt Mill, Germany.
W. Hamburger, Pitten, Austria.
Union Industrial de Papel, La Pobla de Claramunt, Spain.
Cascades Boxboard Group, Toronto Mill, Canada.
Amcor Cartonboard, Petrie Mill, Australia.
Cocelpa Celulose do Parana, Curitiba, Brazil.
Papel Caisas e Embalagens/PCE, Amazonas, Brazil.
Cia Suzano de Papel e Celulose, São Paulo, Brazil.
Abitibi-Consolidated, Alma Division, Quebec, Canada.
Ledesma, Jujuy, Argentina.
Companhia Melhoramentos, São Paulo, Brazil.
Papeles Industriales, Santiago, Chile.
Cenibra Celulose Nipo-Brasileira, Minas Gerais, Brazil.
Mondi Kraft, Richards Bay Mill, South Africa.

Bahia Sul Celulose, Bahia, Brazil.
Carl Macher, Brunnenthal, Germany.
Banque de France, Vic-Le-Comte, France.
Dresden Papier, Heidenau, Germany.
OP papirna, Czech Republic.
Kunshan Banknote Paper Mill, Kunshan, China.
Baoding Banknote Paper Mill, Baoding, China.
Chengdu Banknote Paper Mill, Chengdu, China.
Mead Westvaco Corporation, Chillicothe, OH, USA.
Guangzhou Paper Company, Guangzhou, China.
Changjiang Paper, Jiangyin, Jiangsu, China.
Mercer International, Landquart, Switzerland.
International Paper, Quinnesec, Mi, USA.
Andhra Pradesh Paper Mills, Secunderabad, India.
Jefferson Smurfit Group, Wrexen, Diemelstadt, Germany.

Coating technology
Cascades Boxboard Group, Toronto, Canada.
Cascades Fine Paper Group, Saint Jerome, Canada.
LEIPA Georg Leinfelder, Schwedt, Germany.
N.N., China.
Feinpapierfabrik Dr. Franz Feurstein, Traun, Austria.
Krkonosske Papirny, Hostinne, Czech Republic.
Papierfabrik August Köhler, Oberkirch, Germany.
Foshan Huafeng Paper, Foshan, China.
Ningbo Zhonghua Paper, Ningbo, China.
Groupe CMCP, Kenitra, Morocco.
Obeikan Industrial Investment Group, Riyadh, Saudi Arabia.

Winding technology
LEIPA Georg Leinfelder, Schwedt, Germany.
Stora Enso Magazine Paper, Maxau Wolfsheck Mill, Germany.
N.N., China.
N.N., China.
Feinpapierfabrik Dr. Franz Feurstein, Traun, Austria.
Papresa, Renteria, Spain.
Norske Skogsindustrier Follum Mill, Hønefoss, Norway.
Sappi Ehingen, Germany.
M-real Zanders, Werk Gohrsmühle, Bergisch Gladbach, Germany.
W. Hamburger, Pitten, Austria.

Finishing

Janus Concept
LEIPA Georg Leinfelder, Schwedt, Germany.
Stora Enso Magazine Paper, Maxau Wolfsheck Mill, Germany.
Gold East Paper (Jiangsu), Dagang, China (2).

Ecosoft calender
Nenan New Century Hengxing Paper, Suixian, China.
Feinpapierfabrik Dr. Franz Feurstein, Traun, Austria.
Papresa, Renteria, Spain.
Zhangqiu Huashi Paper, Zhangqiu, China.
Shenzhen Wander Color Printing & Packaging, China.
Guangzhou Paper, Guangzhou, China.
Zhejiang Rongfeng Paper, Ronfeng, China.

NipcoFlex calender
Stora Enso Packaging Boards, Baienfurt Mill, Germany.

Calenders
Henan New Century Hengxing Paper, Suixian, China.
Gold East Paper (Jiangsu), Dagang, China.
Shandong Huazhong Paper Industry, Zaozhuang, China.
LEIPA Georg Leinfelder, Schwedt, Germany.
Shanghai Chung Loong Paper, Shanghai, China.
Zhangqiu Huashi Paper, Zhangqiu, China.

Twister/Roll Handling
Papresa, Renteria, Spain.
LEIPA Georg Leinfelder, Schwedt, Germany.
Dresden Papier, Heidenau, Germany.

Roll cutting machines
Stora Enso Magazine Paper, Maxau Wolfsheck Mill, Germany.
Gold East Paper (Jiangsu), Dagang, China (2).
Papierfabrik Adolf Jass, Schwarza, Germany.
Feinpapierfabrik Dr. Franz Feurstein, Traun, Austria.
Papier- u. Kartonfabrik Varel, Varel, Germany.
AO Kondopoga, Kondopoga, Karelia.
Emin Leydier, Nogent-sur Seine, France.
LEIPA Georg Leinfelder, Schwedt, Germany (3).
Ningbo Zhonghua Paper, Ningbo, China (2).
Papresa, Renteria, Spain (2).
International Paper, Jay, USA.
Guangzhou Paper, Guangzhou, China (2).
Shanghai Chung Loong Paper, Shanghai, China.
GAP Insaat Yatirim ve Disticaret, Turkestan.

Parent reel cart
Papresa, Renteria, Spain.
LEIPA Georg Leinfelder, Schwedt, Germany.
Gold East Paper (Jiangsu), Dagang, China.
Guangzhou Paper, Guangzhou, China.

twogether

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