

Small and sophisticated – Production lines for banknotes and security paper



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Special-purpose paper machines
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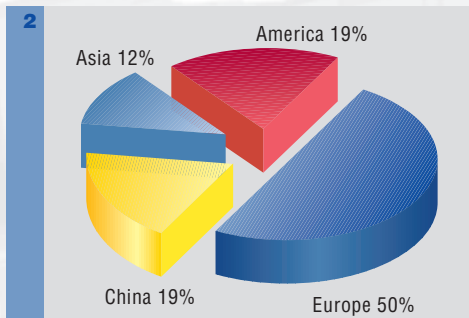
There are only about thirty producers of banknote paper worldwide, most of them state-owned companies. Their total annual output is very low at around 140,000 ton – comparable to that of a single newsprint machine over four or five months. However, this is a question of supply and demand. Every country naturally wants to have a stable currency, with a limited circulation of durable legal tender. That is why banknotes are not in steeply rising demand and play such a small role in global paper production – but only quantitatively!

Qualitatively, however, banknote production is one of the most highly esteemed traditions in the art of papermaking. Due to the necessarily secret ingredients and processes involved, the alchemistic mystery formerly attached to papermaking still exists here to some extent.

The skills and perfectionism required for manufacturing these special-purpose papers apply even more to the production

machinery. Voith Paper is clearly the global market leader in this sector, both with regard to design and construction.

Indeed, banknote paper production lines are one of the best references for Voith Paper's know-how in meeting the most demanding customer requirements. They also reflect our reputation for total reliability when confidential matters are at stake.



Market situation

There are only about thirty producers of banknote paper worldwide, most of them state-owned companies. Their total annual output is very low at around 140,000 ton. As shown in **Fig. 2**, the greatest world market share of banknote paper production is still in Europe. However, Asia is clearly a growth market with high potential for banknote paper machinery.

The Chinese market is deliberately emphasized in this diagram. Over the last fifteen years, ten new production lines for banknote paper have been installed in China. For nine of these, Voith Paper either supplied the entire machinery or the main production components.

Banknote paper machines and equipment are developed and built at the Voith Paper Düren plant, where vast experience has been accumulated in this discipline. In June 2001, the Düren team received another order from Asia, this time placed by Security Paper Ltd. for a new production line in Pakistan (**Figs. 1 and 3**).



Fig. 1: Banknote paper machine for Pakistan.

Fig. 1: Worldwide banknote production.

Fig. 1: Contract signing with Security Paper Ltd. in Pakistan.

Banknotes are to be produced here in compliance with today's international quality and security standards. The new machine will be installed next to the first one commissioned in 1969, which will then be used mainly for passport and identity card production.

This new machine centers around a cylinder mouldformer concept, newly developed by Voith Paper two years ago, combining modern headbox technology with the latest innovations in step diffuser and dilution water control systems. The second cover layer embedding the security thread is produced in a shortformer, and the machine also incorporates a 2x2 Eco-soft calender. Apart from the paper machine as a whole, the scope of supply also includes most of the stock preparation line, as well as a winder and a cross-cutter.

Market upswing with the new Euro currency

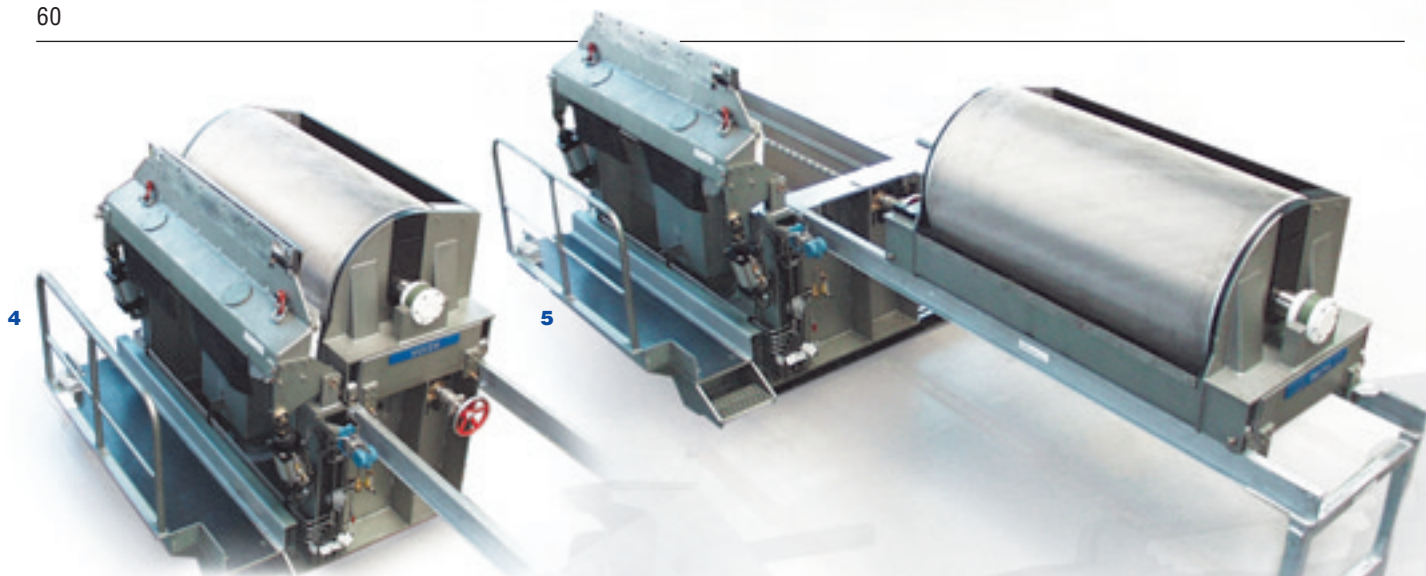
With the advent of Euro currency and respective innovation requirements, the

European market for banknote paper machinery has experienced an upswing over the last few years. Many experts regard the new Euro banknotes as the world's safest from the forgery point of view.

Making paper according to these high security standards, increasingly double-ply technology is used, where Voith Paper is the market leader. In nearly all Europe's banknote paper machines, the second layer is produced by a specially developed shortformer (**Figs. 4 and 5**). Six of these are already in service in Europe alone, and a seventh is just about to be commissioned.

A sophisticated and flexible technology

With few exceptions, banknote paper is produced on synchronous cylinder mouldformer machines – the only technology enabling a multitone watermark. As mentioned, Voith Paper has developed for this purpose a new cylinder mouldformer combining modern headbox technology



with the latest step diffuser and dilution water control innovations. This state-of-the-art system is already well-proven on several banknote paper lines.

A key component of this new cylinder mould concept is the expansion cylinder (Fig 6), which holds several modules in tension. In one of these modules, the watermark for the respective banknote paper is embossed. Since banknotes of different sizes in various currencies are generally produced on the same machine, frequent wire changing is necessary. To facilitate wire mounting and removal, tensioning and release, an expansion cylinder was developed with an ingenious mechanism enabling its diameter to be enlarged or reduced by up to 30 mm – while fully maintaining geometrical precision and concentricity.

Banknote paper machines have a web width up to 2,800 mm, with an operating



speed range of 20-90 m/min. Voith Paper's shortformer and cylinder mould-former technology with expansion cylinder are playing an important role in combating banknote forgery more efficiently in the future.

Special materials for special needs

Requirements such as forgery prevention and extreme durability put banknote paper production in a class of its own. In this age of sophisticated copying systems and clever forgers operating worldwide, a good deal of technical sophistication is required to keep each banknote an inimitable original.

Security features start with watermarks and security threads incorporated in the paper, together with embossed surfaces and holograms. The printing process adds further features, some of which are visible to the naked eye while others can only be detected with special equipment. Formerly, when security measures were not so extensive, numerous amazingly good forgeries came into circulation. Since then, however, nobody has ever succeeded in forging modern banknote paper without detection – one to zero for papermakers, and of course for paper machine manufacturers as well!

Depending on face value, European banknotes last ten months to five years before they are taken out of circulation. During their life, they change hands millions of times and are folded many thousands of times. They frequently go through the washing machine, are heated, damaged and ironed out again. To withstand such treatment, a special kind of furnish is required, which is why banknote papers contain up to 90% cotton (Fig. 7).

Only for security paper not exposed to such treatment is bleached chemical pulp used instead of the much costlier cotton. This kind of paper is used, for example, for passports, identity cards, credit cards, checks, securities certificates, postage stamps and the like.

Some people seem to think that banknotes will stand up to anything – even lighting a cigar. However, we have not yet attained such technological heights...



Figs. 4 and 5:
The Voith Paper shortformer.

Fig. 6: *The expansion cylinder developed by Voith Paper.*

Fig. 7: *Cotton, the primary raw material used for banknote paper production.*