The General Trend in Modern Paper Machine Clothing

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It is no exaggeration to state, that there has been an extremely rapid development in paper machine clothing during the last 10 years. The conventional woven wet felts have rapidly been replaced by needled designs containing more and more synthetic fibres. Thanks to these new fibres and other design improvements the felt running times have become much longer in spite of the fact that paper machines today generally run much faster than only a few years ago. This has led to a strong reduction of the consumption of felt per ton of paper produced. The long range forecasts by the United Nations Food and Agricultural Organization (FAO) indicate a steady growth of the total paper production, while the consumption of machine clothing for the press and dryer sections of pulp and paper machines will continue to decrease as indicated in Figure 1. In many countries the specific felt consumption is only half of what it was about 10 years ago. (Figure 2.) In Europe about 200 grams per ton of paper were used in 1970 for the press and dryer section. In Scandinavia the felt consumption was only 180 g/ton. As the inevitable price changes because of rapidly increasing cost of labour, research, development and service have been very moderate, the cost per ton for paper machine clothing has shown a downward trend.

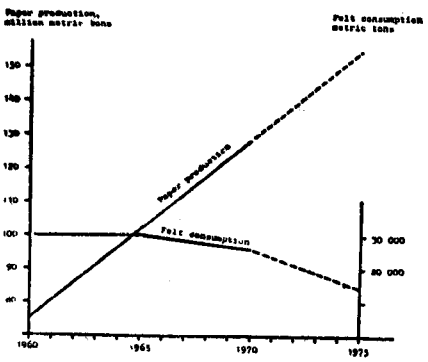

Fig. 1.

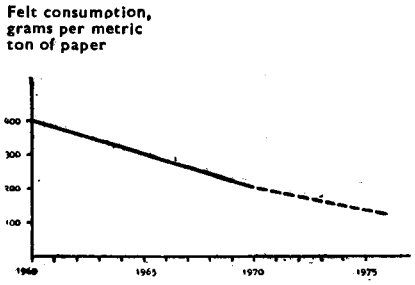

Fig. 2.

This development has been most dramatic in the press section but similar trend can be seen also for the dryer section clothing. Here the conventional, practically unpermeable cotton and wool dryer felts have been rapidly replaced by a new all-synthetic design with higher permeability and longer running times. This has in many cases led to increases in production because of more rapid evaporation but the most significant consequence has been that the new type of dryer clothing makes it possible to achieve better general ventilation of the whole dryer section. A more even dryness profile has been one obvious consequence. It must, however, be realized that it is much more difficult to analyse the conditions in the dryer section and to evaluate the economical consequences.

The development of the press section design has been very rapid in direction of improved efficiency. All the new press types, for instance the fabric press, the shrink fabric press, the Venta-Nip presses and the double-felted presses have one thing in common and that is that they need special types of machine clothing for their proper function.

In all the new presses the distance for the water to flow inside the press nip has been considerably reduced which has allowed the use of higher linear pressures and also given the possibility to run at higher speeds without crushing of the paper sheet. In general these new press types also show improved pressure distribution.

This rapid development in press designs and in modern type of machine clothing goes back to the theoretical and practical studies regarding the theory of pressing which were made by Borje Wahlström of KMW in Sweden. His basic ideas, published about ten

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years ago, are still valid although several improvements and refinements have been made.

As indicated before, completely new types of clothing are absolutely necessary for some types of presses. The fabric press and the shrink fabric press could not possibly function without the endless woven, double-layer monofilament plastic wire INNERTEX developed by Nordiskafilt. The combination of the innerbelt and the felt led to COMBITEX where all-synthetic fibre webs are needled on a mono filament base fabric. In this connection it is well worth to mention that the fabric press is attracting an increasing interest and that the number of new installations is growing steadily. One example is KMW's new liner machine for Weyerhause in the US. This machine, which is the widest in the world, has four fabric presses.

Another starting point for modern felt development was the discovery that the crosswise threads in the baseweave of a needled felt only have a negative function as far as water handling is concerned. By eliminating these threads completely or reducing their number and size, improved water flow in the press nip as well as less marking could be achieved. A further refinement of this technique is the use of fine monofilament threads crosswise which improves stability and makes it possible to control the width contraction during manufacturing in a better way (PERMATEX). The most recent innovation is NOVOTEX, the completely baseless felt, consisting only of fibre webs without any baseweave at all. In this design the optimal combination of permeability and non-marking properties have been reached.

In the paper machines forming part the phosphor bronze wires are now rapidly being replaced by plastic fabrics. These are generally made in single-layer weave of multi or monofilatment hreads. They are either endless round woven or long woven and spliced. The latest news in this field is the double-layer plastic fourdrinier wire recently developed by Nordiskafilt. The double-layer design makes the wires strong and stiff and well suited also for big fast-running machines. Why not mention here that the first double-layer plastic fourdrinier wire for a 7-m-wide liner machine running 500 m/min worked 179 days replacing phosphor bronze wires running only 8-12 days. A finer type still running since 85 days on a 7-m-wide newsprint machine with a speed of 660 m/min.

In order to demonstrate that the development has really been very rapid and that Nordiskafilt has made significant contributions to this development, table 1 has been compiled. This shows where and when the most actual product types were introduced for the first time.

Needled felts were developed in the United States but our company was the first to introduce them in Europe in 1957. The rapid development after that time is well-known. As far as special types of needled felts are concerned our company has been leading. We were the first in Europe with fillingless felts and COMBITEX and PERMATEX were developed completely in Halmstad. Already in 1967 the first trials were made in Germany with baseless felts. They did not work well and they were not completely without baseweave. Our NOVOTEX, which however is completely baseless (non-woven) is based on on a completely new principle, which was developed in Halmstad.

Table 1. Innovations—paper machine clothing

	USA	Europe	Nordiskafilt
Conventional needled felts	1956*	1957	1957
Fillingless needled felts	1964*	1966	1966
Combination felt COMBITEX	—	—	1966*
PERMATEX	—	—	1969*
NOVOTEX	—	1967	1968*
Forming fabrics for pulp	—	1954*	1958
Dryer screens SCREENTEX	—	—	1962*
Innerbelt INNERTEX	—	—	1963*
Forming fabrics for paper, MONOTEX	1959*	—	1961
Forming fabrics, double-layer, DUOTEX	—	—	1971*

Our development work for plastic forming fabrics started with endless woven wires for pulp. As you may know the first wires of this type were manufactured in the German Democratic Republic, mainly because bronze was not available in sufficient quantities. These endless woven single-layer wires were very successful but after a few years they were replaced by long woven end-spliced designs. In 1962 our company produced the first dryer screen, which was delivered to a big paper-mill in Finland. Double-layer endless woven innerbelts were introduced by Nordiskafilt in 1963 together with KMW and the Central Research Laboratory of the Swedish Paper Industry in Stockholm.

The development in the field of forming fabrics for paper is more complicated. Already at the end of the 50's trials were made in the United States with fabrics produced from multifilaments: our first monofilment fabrics produced coarse papers in Sweden already in 1961. Our develppment work for forming fabrics for paper was intensified after the purchase of our Norwegian subsidiary NORDISKA FILT og Virer A/S in Oslo in 1965. Then in 1971 Nordiskfilt introduced the double-layer plastic monofilament fourdrinier wire DUOTEX now extremely successfully running on different paper grades.