The Development of Press and Dryer Felts for Paper and Pulp Machines

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During the first half of this century there were still no essential changes to be seen in paper, board and pulp dryer machines. Therefore there were no great novelties available in machine felts, either. Nothing but different woollen felts were used.

It was not before in the 50's that there was some progress in the technical development, because now they built large and fast machines. The paper industry made more demands and the felt makers had to meet these requirements. This was the start of the enormous development in the felt industry, which has not come to an end thus far.

At first various chemicals were employed for the impregnation of felts and at the same time more and more synthetic fibres were used in woollen felts. Already due to these measures the running results of felts were improved remarkably. At first the synthetic content was 20-50% nowadays the new types are all synthetic.

The introduction of the needling method was of great consequence to the further development of felts. The production capacity of needled felts is increasing from year to year, whereas conventional felts are loosing some of their significance.

Due to the stable synthetic fibres and new production methods it has been possible to increase the life of press felts to a considerable degree. In the dryer section there has been a steadily increasing transition to mesh dryers, which also denotes progress.

In this lecture I should like to tell you about our new felt qualities and their use in different positions. Let us start with felts for pulp dryers.

Sample 1

The quality code of this felt is 41Vd-28. It is 100% synthetic and weighs approximately 1400 g/sq. m. The felt is made of twisted yarns in plain weave. The synthetic fibres are of Polyamide. The felts are impregnated with synthetic resin, which makes them more stable and durable. Impregnated fibres will not be so easily compressed as untreated fibres. Heatsetting makes the felts stable in dimensions.

The quality 41Vd-28 is mostly used in the 1st and 2nd suction presses of pulp dryer machines, sometimes also in plain presses. The running time is approximately 60-90 days depending on running conditions.

Sample 2

The quality code of this press felt for pulp dryer machines is TAMBAT. This is a needled, 100% synthetic felt, the base weave of which is made of multifilament Polyester fibres. The weight of the base is approx. 450 g/sq. m. On this base there is needled about 550 g Polyamide per sq. m. so that the weight of the felt will be increased to 1000 g/sq. m.

This felt will guarantee an even surface of the pulp web. Rough fibres on the upper side ensure an unobstructed permeability and the non-compressible base weave prevents the web from breaking at the press. The water will be removed from this kind of felts through suction.

In our opinion the felts must be needled on both sides for two reasons: first of all, to keep the rubber covered rolls from wearing and secondly to increase the suction power in the suction boxes.

Despite of the fact that this is a relatively new quality, excellent results have been obtained in some sulphate mills, where this felt has run in the 1st press. The running times have been even 3 months.

Let us now discuss the felt types for paper and board machines.

Sample 3

Here you see a weftless felt type, the quality code of which is TAMVENT. The word weftless means that there are only very few crosswise yarns in this felt, i.e. just enough to keep the base weave together. Some felt makers use in the manufacture such weft yarns that dissolve during the finishing thus disappearing. This material can, however, stay in the felt and result in clogging up the felt. We are using some weft in our felts to make them more steady and durable.

The water removal is very good. It has been noted, that when this felt has been used, the dry material content has increased by some percent, for example from 38% to 42%. This all synthetic quality can be supplied in different weights starting from 750 g/sq. m. In general the felt weighs 1,000-1,100 g/sq. m.

TAMVENT felts are used on large fast running newsprint, kraft paper and board machines and with very good results. As an example there can be mentioned a newsprint machine on which a TAMVENT felt ran in the pick-up-press for 60 days the machine speed being 700-750 m/min. In another newsprint machine a TAMVENT felt ran as a transfer felt for 150 days. In this case the felt was running through two presses whereat the strain was very heavy. The felt had to be taken off because of a damage. The machine speed here was about 600 m/min., which indicates that this felt is mechanically very strong.

Sample 4

Also batt-on-mesh felts are run in the presses. The quality code of these felts is TAMBAT. The structure of this felt very much resembles that of the felt sample 2. The difference between these felts is the fact that the surface fibres of TAMBAT are finer. This felt is used in various presses. Since it is

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all synthetic it is mechancally very strong which guarantees a long running time. This felt as also all the other 100% synthetic felts can be washed with a 5-10% caustic soda solution.

Here I have described some press felt types, which are gaining more and more popularity. It is difficult to say which one of these types, TAMBAT or TAMVENT will conquer the market. It depends, as is known, on the prevailing running conditions. The experiments take still a lot of time and therefore the direction of the development cannot be said for sure yet.

My personnel opinion is that TAMVENT felts will gain still more foothold and their use will increase. In the near future baseless press felts are likely to come on the market. They are extremely suitable e.g. for grooved rolls.
Now I should like to tell you something about the felts for the dryer section.

Earlier only woollen felts were run in the dryer section, then there was a change to cotton felts, and recently various open synthetic fabrics have been taken into use. It is typical of these fabrics that they are light and therefore easy to install on the machine. A great advantage is also the fact that when these dryer screens are used the felt dryers become unnecessary and thus there will be some saving in steam. In this way it has been possible to increase the drying capacity of some old machines, while the felt dryers have been used as drying cylinders.

Only in the first group of the dryer section there are woollen or cotton felts or needled all synthetic dryer felts. Dryer screens are often supplied equipped with a clipper seam, but they can also be equipped with a hand-made seam which, however, requires plenty of time : two people need one hour for 1.5 cm. Naturally also the price of this seam is high.

Let us begin with the first group of the dryer section.

Sample 5

The quality code of the new dryer felt for this group is TAMDRI. It is a 100% synthetic, needled felt. The base weave is made of polyester monofilament. On this base there is a needled surface layer of polyester. The weight of the felt is approx. 1100 g/sq. m., but it can be increased if necessary. Due to its small weight TAMDRI is easy to install on the machine. The felt has a good permeability and a non-marking surface. The raw material makes the felt durable and gives it dimensional stability.

In the mills where this quality has been used, they have obtained good running results. In 1970 before Christmas a new board making paper machine started-up in Finland with TAMDRI dryer felts in the 1st top and bottom dryer groups.

According to some opinions the woollen and cotton felts in the first groups will be replaced with this felt type.

Sample 6

As the running conditions e.g. on kraft paper machines are very severe, the hydrolysis of dryer felts cannot be avoided. Due to this the dryer screen gradually becomes unfit for use. That is why the running times are short, sometimes only a couple of months. Our dryer screen TAMPER 100 is designed just for these difficult running conditions. TAMPER 100 is made of very durable materials: the warp thread is of asbestos, acrylic and aromatic polyamide fibres, which are very heat resistant. The weft yarns contain asbestos and acrylic fibres. The weight of the felt is 1400 g/sq. m. This dryer screen suits very well particularly kraft paper and kraftliner machines, or if special heat resistance is required.

Sample 7

We have been making mesh dryers for some some years now. The sample is of our TAMFIL mesh dryer, which is made of polyester. Its weight is 1200 g/sq. m. In general TAMFIL is supplied equipped with a clipper seam, but it can also be equipped with a hand-made seam. The clipper wire is very firm; it has operated perfectly for 670 days on a paper machine running 700 m/min.

These mesh dryers are mechanically very strong. From our experience during several years we can state that the average running time of these mesh dryers is 1-5 years. On some fast running newsprint machines running times of even 2-5 years have been obtained.

When the paper web is dried in the dryer section, the edges are over dried. The middle of the web is therefore much more humid than the edges. Our research department was working with this problem and came to the following conclusion :

To correct the moisture profile of the paper web with the TAMFIL mesh dryer it should be made so that the edges are denser than the middle part. If the air permeability in the middle is e.g. 4000 m^3/m^2 h, the permeability can be gradually reduced so that at the edges it is 1000 m^3/m^2 h. We call this kind of mesh dryer TAMFIL Special. With TAMFIL Special the moisture profile of the paper web can be made more uniform.

It is clear that one mesh dryer is not enough, but there must be fore of them. In the first groups there usually is some kind of dryer felt. If several TAMFIL Special mesh dryers are used in the following groups, the desired effect is obtained. Due to the even moisture profile also, paper rolls are more uniform and the amount of eventual waste decreases.

On fast-running paper machines, e.g. on newsprint machines it has been noted that the edges start to flutter as soon as the speed of 600 m/min. is reached. This edge flutter is due to the flow of air. The edge flutter can be reduced by TAMFIL Special, and in some cases it has been totally eliminated. Also the paper web runs mort smoothly and the number of the breaks due to edge flutter is decreased.

In order to know the way of graduating the permeability in a mesh dryer it is important that the moisture profile in question is available. In addition to that, the speed of the machine, the paper quality, and the relative humidity of the air blown off must be known.

We have supplied various mills with TAMFIL Special already for some years with good results. The earlier mentioned difficulties with large machines have been overcome through the use of TAMFIL Special. There has also been a slight increase in the capacity of some old machines.

Our TAMFIL Special has been patented in many countries.

Sample 8

This is a sample of our TAMFAB mesh dryer, which differs from TAMFIL in that it has been made of multifilament fibres. The raw material is polyester. In the crosswise direction every other yarn is of monofilament to make the crosswise stability as high as possible. TAMFAB is not, it is true, so much used as TAMFIL, but the obtained running results are very convincing. The multifilament yarns in the lengthwise direction are elastic and they are well adaptable to older machines the guide rolls of which are not big and the felt guiding devices of which are weak. Also TAMFAB mesh dryer can be made denser at the edges.

In this lecture I have been treating our new press felt and dryer screen qualities. We are naturally all the time developing new types, some of which are already at an experimental stage. Yet it is too early to say anything about them, because no final results are available.

It seems to me that the enterprising spirit of the felt makers is diminishing as far as new products are concerned, and that the main stress is laid on the improvement of the qualities. This serves as a benefit both for the customer and the supplier. Some time ago there were so many new felt types put on the market that the customers found it difficult to make their choice between the different qualities.

At the moment it looks as though the weftless felt type would become a generally used felt. This felt can be used for every paper quality and every press type, because the fineness of the lengthwise fibres, the total weight, or the quality of the surface fibres can always be changed according to the need. Of course there are also exceptions.

Finally it can be mentioned that there will be plenty of time saved for the paper maker on the grounds that felt installations are less frequent because of longer running times. This too, indicates that the felt makers are by no means behind in the development.