synthetic fibres in paper industry†

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Tradition says that paper was invented by Kung Tson Tsai Lun, a Chinese Minister, in 105 A.D., but one can definitely assume that paper for writing, which Tsai Lun produced from pounded plant leaves and rags, was invented earlier—at least around the time Christ was born.

Japanese paper is the most beautiful of all kinds of paper. So far it has not been possible to produce machine-made paper of such beauty and strength. The art of paper making was brought to Japan from China, via Korea, in 610 A.D. by the Monks. Hemp and old fishing nets were used as basic material. Crown Prince Skotoku (572-621 A.D.) gave full support to paper makers and issued orders to plant Mulberry trees. The inner portion of the bark of these Mulberry trees was used for paper making. In course of time, two more plants viz. Mitsumata and Gampi were found to yield a good raw material for paper. Subsequently came the use of Bamboos and grass material containing sellulose, for the making of paper.

The ever-growing demand of paper has already displaced the art of hand paper making, by machines, and the need for high quality paper has compelled the paper makers to partially switch over from natural cellulosic material, to man-made fibres as raw materials.

The use of man made fibres and especially of 100% synthetics in textile applications, suggested the utilisation of such fibres in the field of paper makng. No doubt the manufacturing conditions which govern paper making are borne in mind and the fibres adapted to those conditions. Everyday articles now in use, which are made of paper, already contain man made fibres. Special paper as for example, for identity cards, maps and filters, are entirely made from man made fibres and are quite common. There are two groups of man made fibres utilised for paper making :

(a) Regenerated cellulose fibres

(b) 100% synthetics.

Papers made from regenerated cellulosic fibres:

The most common are viscose rayon and staple as also Cuprammonium filament and staple. These threads are usually cut to 6 m.m. length for use in paper manufacturing. This length ensures good working on paper machines, Farbenfabriken Bayer supplies the cuprammonium staple quality-"Cuprama Special" for the paper industry. If this quality is mixed with pulp papers are obtained which can be used as overlay papers, or for different kinds of filters. Overlay is a thin paper, which is placed over the dyed or printed laminate paper in the production of laminate boards.

Papers made from 100% synthetics :

The Staple length of 6 m.m. is quite favourable for this type of fibre as well, when used in paper making. The count may vary between 1.3 and 10 deniers.

The wet strength initially required is difficult to achieve in papers made from 100% synthetics, because of the absence of H-bonds, which help to increase the strength of paper as in the case of cellulose. The polar forces in synthetics have a weaker bonding power than the H-bonds, thus giving a paper of lower strength. Good fibrillation is therefore required to enhance the strength. It therefore becomes necessary to add a strengthening agent (Latices). Fibrillation as in case of cellulose, is easily obtained in acrylic fibres made by a special spinning method. This spinning method produces a sponge-like fibre structure, which promotes fibrillation on treatment in a beater or refiner. These fibrils produce a felting effect in the paper which increases the tear resistance. It is also not difficult to produce coloured or optically whitened Acrylic papers. A starch coat can be easily applied in the sizepress : likewise, it will be easy to apply fillers or to size such papers. Acrylic paper can be processed in the same manner as conventional paper made from wood pulp. The relative wet strength of Acrylic papers is 65-70% without using a wet strength promoting agent, and their absorptive capacity is considerably greater than that of cellulose papers. Acrylic fibre being thermoplastic, (i.e.,

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its shape can be changed under the action of heat can be given a design in hot embossing. Cellulose and Acrylic fibrill fibres can be mixed in any desired proportion. Papers which contain Acrylic fibrill, have a higher dimensional stability. The only precaution is that both types of fibres must be beaten separately, since the beating of the cellulose pulp is more severe, which will produce an over-short pulp in case of Acrylic fibrill. Mixing should be done in stuff-chest.

Different conditions prevail when synthetic fibres are used, which cannot be fibrillated like Acrylics. The strength of such papers is low and it is necessary to after-treat with different kinds of latices. The ready-made papers are generally emersed in the latex, or sprayed with latex and then dried.

The strength of the paper can also be improved by a more conventional method, viz. by impregnation with solutions of inorganic salts such as ammonium sulpho-cyanide or zinc chloride.

In recent years, the use of cellulose papers containing a proportion of polyamide fibres, is becoming popular. This type of paper is employed in the manufacture of maps and bank notes, but the proportion of the synthetic fibre does not exceed 20-30%, to keep the cost at a reasonable level.

Papers containing man made fibres, and particularly those papers which contain 100% synthetics,, possess advantages over the conventional cellulose paper in respect of superior dimensional stability, absorbancy, wet strength, rate of dehydration, tear strength and resistance to chemicals and microbes depending on the fibre used.