

Manufacture of Filter Paper

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Filter papers, as the name indicates, are paper-sieves used to remove the solids suspended in a liquid medium. They are classified as qualitative and quantitative, depending upon the end-use they are to serve. The latter, has to have a very low ash content. They are also classified as slow, medium, and fast, depending upon the rate of filtration that a standard size cut from it permits. Of course, there are variations in these classifications from manufacturer to manufacturer. Filter papers are also sometimes classified according to precipitate retention, wet strength, resistance to reagents etc. The surface finish of filter papers also contributes to the various properties of the filter paper.

Chemically, filter paper is almost pure alpha-cellulose. It should have no impurities like oxy- and hydrocelluloses, ether solubles, pentosans, etc. Presence of these impurities is likely to contaminate the medium to be filtered. Sometimes, the constituents that go to make ash are also to be specifically avoided.

The best raw material that could be used for the manufacture of filter paper is cotton or linen. In a number of countries sulphate pulps are also used for the manufacture of these papers. Chemical cotton obtained from linters is also an excellent raw material. However, it has to be cleaned and further processed before use. In addition to chemical treatment, mechanical cleaning like pneumatic cleaning, washing and passing through sand traps and centricleaners is also required when processing linters for filter papers. A number of unusual raw materials have also been investigated for the manufacture of filter papers, such as wool and cotton blends, asbestos and cellulose mixtures, inorganic fibres including glass, alumina, quartz and even stainless steel. Organic fibres, such as PVC, Nylon, etc., have also been investigated to find out if filter papers produced therefrom would have any exceptional property, thus efficient air filters can be produced from a mixture of asbestos and cellulose. Filters made from plastic fibres show good resistance to acids and alkalis, but they are readily attacked

by common organic solvents. They also cannot be used for filtration of hot liquids, thus excluding their use in general analysis. Inorganic fibre papers have certain advantages due to the nature of the fibre; but they have also the drawbacks, like high ash content and poor retention property.

Purity of chemicals employed for the processing of filter papers, like caustic soda, hypochlorite, sulphuric acid and water have a direct bearing on the quality of the filter paper. For example, impurities from water are easily absorbed by chemical cotton during processing, since it has a strong base exchanging property. For good quality filter papers, therefore, demineralised water is generally employed.

In India, practically all the filter papers are imported. From the import figures, which were 30-40 tons in 1958-59, rising upto about 100 tons in 1964 (12 months), it could be gauged that a great potential exists for filter papers in India. This is likely to increase much more as the industrial and scientific growth in the country takes place. Since India produces quite a quantity of raw materials that could be used for the manufacture of good filter papers export potentialities are also large. Some hand-made paper centres are producing filter papers but the quality leaves much to be desired.

After considerable work in this laboratory on cotton linters, it has now been possible to produce hand-lifted filter papers of good uniform quality equivalent to Whatman No. 1 in function; and regular production trials are now in progress. Some demands of the users in this regard are being met from the limited production in the laboratory.

The processing is carried out using traditional paper machinery, e. g., rotary digesters, washers, Hollander beaters, bleaching, etc. The sheet making is, however, for the present being done on a vat developed in the laboratory and a paper of size $16\frac{1}{2}'' \times 23\frac{1}{2}''$ is being produced. Work is in

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progress to manufacture other qualities of filter papers and also to transfer the processing on the machine.

The following table gives some of the essential properties of our filter papers.

Filtration Table

	Whatman's No. 1	A	B	C
Thickness mm.	0.16—0.19	0.18—0.19	0.18—0.19	0.17—0.19
Burst (lbs/sq.inch) (Ashcroft).				
Dry	11.8	23.0	18.6	20.6
Wet (5 ply)	5.0	7.8	7.3	8.6
Clem's water absorption test (Cms.)				
1 min.	—	2.75	3.85	3.6
5 min.	—	4.44	5.5	5.35
10 min.	7.7	5.55	6.9	6.70
Rate of filtration for 100 c.c. of Barium sulphate solution as per A.S.T.M. method for filter papers.	2 min.	2 min. 50 sec.	1 min. 50 sec.	2 min. 15 sec.
Weight/Ream	20 lbs.	18-20 lbs.	18-20 lbs.	18-20 lbs.

A, B and C indicate samples from different experiments.

A and B couched and lifted on felts.

C couched and lifted on thick cloth (canvas)

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