

100% Nonwood Fiber Content Papers - Part 4: Bleached Papers Physical Properties

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April 2002

The data contained in the following table is from an excellent paper entitled "Industrial Experiences & Problems Involved In Stock Preparation & Papermaking Utilizing Non-Wood Fibrous Materials", written by D.K. Misra, Thessalian Pulp & Paper Industries Ltd., Larisa, Greece, and published in 1975 in the TAPPI Non-Wood Plant Fiber Pulping Progress Report No. 6.

This data was developed from tests on commercially produced paper and paperboards which were available at the time. Some of this data likely is a little outdated due to advancements in paper machine design such as improvements in Fourdrinier drainage and the development of twin wire paper machines and no-draw press sections, all of which allow for a high nonwood fiber fraction in the furnish. Nevertheless, this actual mill data still offers a valuable insight into the potential use of nonwood fibers in papermaking.

Unfortunately, since this paper was presented, no one has undertaken a similar ambitious project to determine the characteristics of currently available nonwood fiber content papers. With the renewed interest in nonwood fibers for papermaking in North America and Europe, perhaps the time has come for a research organization to undertake such a project.

The following table provides physical properties of bleached papers produced using 100% nonwood pulps. Even using pre-1975 technology, a few points to consider include:

- the overall strength properties of the paper seem to be satisfactory compared to paper produced with 100% woodpulp
- onionskin typewriting papers produced with 100% cotton fiber possess excellent strength properties and permanence, for which they are sold at premium prices

It is technologically possible to produce paper with 100% bagasse, wheat straw or reed pulps, but economically this is highly questionable because the paper machine speed typically must be reduced by 35-50% putting a serious limitation on achieving optimum production rates. However, the situation may occur periodically in some developing nations due to lack of long-fiber pulp. For a suitably designed paper machine (designed for this contingency), a production rate could be established at 75-80% level.

Regardless, adding 10-25% long fiber pulp is considered the most satisfactory method to maintain optimum production both for output and paper quality.

Bleached papers produced with 100% nonwood pulps																
Paper Grade	Furnish	Basis Weight (g/m ²)	Ash (%)	Thickness (microns)	Breaking Length (m)	Burst Factor	Tear Factor	Fold No.	Cobb (g/m ²)	Porosity (sec/100cc)	Opacity (%)	Brightness	Denison	Finish	% Hygro-Expansion	
Bagasse															MD	CD
Printing & Writing	100% bagasse	48		70	3534	22.0	58.3	7.0						MF		
Printing & Writing	100% bagasse	52		72	3675	22.0	63.5	16.0						MF		
Printing & Writing	100% bagasse	62		86	3860	23.1	56.5	12.5						MF		
Printing & Writing	100% bagasse	71		120	4296	24.6	61.8	28.5						MF		
Printing & Writing	100% bagasse	75		119	4280	24.5	74.7	39.0						MF		
Reed																
Printing	100% reed	80	10.1	170	2670	9.0	47.3	2	21	9	96.0	70.0	4	MF	0.4	2.1
Straw																
Printing & Writing	100% wheat straw	70	9.8	101	4430	22.6	56.1	16	24	184	85.0	89.5	12	MF	0.5	3.0
Printing & Writing	100% wheat straw	70	8.0	90	5390	29.4	45.5	38	29	334	84.0	91.0	13	SC	0.6	3.6
Printing & Writing	100% wheat straw	80	10.3	105	3400	20.1	50.9	7	20	100	91.0	74.0	11	MF	0.5	2.7
Cotton																
Writing	100% cotton	34	0.4	55	6640	40.5	149.5	360	18	1060	53.0	92.0		MF		
Wood-based Papers for Comparison																
Manifold	100% woodpulp	30	5.0	60	4770	21.0	66.0	60	18	56	51.0	84.0		MF		
Writing	100% woodpulp	45	5.8	62	5780	35.1		33	16	45	63.0	91.0	7	MF	0.2	2.1
Writing	100% woodpulp	60	10.7	80	4440	22.8	52.0	30	17	34	76.0	90.0	7	MF	0.2	1.6
Writing	100% woodpulp	70	9.5	100	3860	15.0	54.0	13	18	68	82.5	94.0	12	MF	0.2	1.8
Writing	100% woodpulp	80	8.5	106	3730	17.3	56.0	32	19	29	85.0		11	MF	0.2	1.9
Offset Printing	100% woodpulp	75	10.2	96	5080	30.2	66.7	95	24	49	85.0	87.0	14	MF	0.1	1.7
Offset Printing	100% woodpulp	80	5.6	105	4530	21.2	42.0	50	18	49	83.0	77.0	12	MF	0.2	1.5
Offset Printing	100% woodpulp	90	12.0	130	4100	20.4	44.0	35	18	29	90.0	83.0	11	MF	0.3	2.2
Offset Printing	100% woodpulp	100	12.1	130	4040	21.0	44.0	58	18	83	90.0	84.0	12	MF	0.2	2.0