

Nonwood Fiber Content Papers - Part 3: Bleached Papers Physical Properties

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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 Some of this data likely is a little outdated due to advancements in paper machine design such as improvements in Fourdrinier drainage and the development of twin wire paper machines and no-draw press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 using different proportions of nonwood pulps**. Even using pre-1975 technology, a few points to consider include:

- writing, printing, MG poster and lightweight papers produced with varying proportions of nonwood pulps are very comparable to those produced with 100% woodpulp
- writing and printing grades produced with 70% esparto pulp give the lowest hygro-expansion which indicates excellent dimensional stability
- tear factor is obviously poor in almost all grades of paper compared to the paper produced with 100% woodpulp, an inherent defect of most of the nonwood pulps
- using a statistical approach to the various properties of paper, writing and printing grades produced with a high proportion of nonwood pulps can be commercially acceptable
- paper produced with a high proportion of nonwood pulps have good sheet formation, printability and opacity.

With respect to the following table, the balance of the furnish in the nonwood content papers typically is bleached softwood kraft. It should be noted that the strength properties of the nonwood content papers could be increased by simply reducing the nonwood content and increasing the softwood kraft content.

Physical properties of bleached papers produced with different proportions of 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	
															MD	CD
Bagasse																
Manifold	90% bagasse	35	1.2	55	2610	10.2	33.4	4	15		66.0			MF		
Printing & Writing	60/90% bagasse	50	10.1	81	2690	9.9	51.5	6	21	18	82.0	80.0	7	MF	0.7	2.5
Printing & Writing	60/90% bagasse	60	10.7	97	2980	12.5	49.3	12	27	30	84.0	77.6	9	MF	0.7	2.9
Printing & Writing	60/90% bagasse	70	10.3	107	3255	16.7	48.4	20	33	37	86.5	78.5	10	MF	0.6	2.8
Printing & Writing	60/90% bagasse	80	9.6	125	3340	17.7	50.8	22	24	52	89.0	80.0	10	MF	0.7	3.2
Printing & Writing	60/90% bagasse	100	7.5	160	3070	19.4	53.3	15			91.0	85.0	11	MF	0.1	2.8
Printing & Writing	60/90% bagasse	140	10.8	220	3170	22.2	58.7	53		122	96.5	82.5	10	MF	0.4	2.7
Bamboo																
Printing & Writing	60/90% bamboo	60	9.3	97	2600	11.6	59.6	8	19	7	88.0	74.0	7	MF	0.2	1.2
MG Poster	50% bamboo	30	2.0	60	4290	12.5	12.5	6	35	10	65.0	73.0		MG	0.6	1.0
Reed																
Writing	80% reed	63	11.1	90	2220	10.0	45.0	2	29	17	88.0	76.0	5	SC	0.1	1.8
Printing	80% reed	90	15.0		3620	12.8	53.0									
Straw																
Printing & Writing	70/80% rice straw	50/55	9.5	84	3920	22.0	56.6	32	35	42	90.9	76.0	11	MF	0.3	2.6
Printing & Writing	82.5% rice straw	60	7.3	100	4000	20.0	58.3	17	42	66	94.0	81.0	12	MF	0.4	2.6
Printing & Writing	70/80% rice straw	70	10.6	106	3720	21.8	60.0	31	27	56	91.0	78.5	11	MF	0.5	2.4

Physical properties of bleached papers produced with different proportions of 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	
															MD	CD
Straw - continued																
Manifold	50/60% wheat straw	31	5.6	60	4900	20.4	68.0	55	26	46	60.5	91.0		MF		
Printing & Writing	75% wheat straw	50	10.6	63	4130	22.0	53.0	64	30	96	74.0	90.0	12	SC	0.2	3.2
Printing & Writing	75% wheat straw	60	13.7	70	4110	21.6	50.0	42		122	80.5	87.0	11	SC	0.4	3.3
Printing & Writing	75% wheat straw	70	16.3	80	3620	20.0	47.0	47	35	194	83.5	90.0	10	SC	0.3	3.0
Printing & Writing	75% wheat straw	80	19.2	90	3581	18.7	42.7	35	47	215	88.0	89.0	9	SC	0.4	2.5
Printing & Writing	75% wheat straw	100	21.7	100	3470	18.0	44.6	38		280	92.0	85.0	9	SC	0.3	2.9
Esparto																
Printing & Writing	70% esparto	65	16.1	100	3325	17.1	82.0	22	22	23	86.0	80.5	11	MF	0.1	1.5
Printing & Writing	70% esparto	70	12.5	132	2860	13.0	65.0	20	22	10	86.0	80.6		MF	0.1	1.3
Cotton																
Writing	25% cotton	80	5.8	115	4040	23.6	68.4	24	19	84	82.0	91.0	+14	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	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	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	100	12.1	130	4040	21.0	44.0	58	18	83	90.0	84.0	21	MF	0.2	2.0