



Standards Council of Canada
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Conseil canadien des normes
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All our physical testing and quality assurance services are ISO 17025-accredited by the Standards Council of Canada. As such, they comply with our clients' ISO 9000 quality assurance requirements.

ORDERING INFORMATION for Bleached Eastern Softwood Kraft Pulp

The pulp is a fully bleached eastern softwood kraft which is sold in sheet form. It is supplied in 454 gram packages. This reference pulp has been cut into 23 cm × 23 cm sheets, randomized and placed in a plastic bag to prevent drying out. It was stored for no less than two years prior to testing.

Chemical Properties

CARBOHYDRATES	
Arabinan (%)	0.7 ± 0.3
Xylan (%)	7.2 ± 1.0
Mannan (%)	5.6 ± 1.1
Galactan (%)	0.5 ± 0.2
Glucan (%)	84.3 ± 2.0
KAPPA NUMBER	0.57 ± 0.09
ACETONE EXTRACTIVES (%)	0.086 ± 0.007
ASH (%)	0.074 ± 0.006
SULPHUR (mg/kg)	36.6 ± 4.8
SODIUM (mg/kg)	301 ± 12
POTASSIUM (mg/kg)	<7
CALCIUM (mg/kg)	51.4 ± 5.4
MAGNESIUM (mg/kg)	10.3 ± 0.5
IRON (mg/kg)	4.5 ± 0.9
MANGANESE (mg/kg)	1.09 ± 0.04
BARIUM (mg/kg)	0.26 ± 0.07

- Chemical tests are not within the scope of FPInnovations' accreditation.
- All data are based on O.D. weight of pulp.
- For each parameter in the table, the mean and twice the standard deviation are shown. About five (5) tests in one hundred (100) will fall outside plus or minus twice the standard deviation.
- Mean values are based on 12 groups of 3 replicates.

Physical Properties

Unbeaten pulp properties	
DISINTEGRATION TIME, min	10
CSF, mL	656 ± 15
BULK (1-PLY), cm ³ /g	2.00 ± 0.11
BURST INDEX, kPa.m ² /g	1.79 ± 0.27
TEAR INDEX, mN.m ² /g	21.16 ± 2.30
BREAKING LENGTH, km	3.07 ± 0.26
Average Fibre Length, mm FQA	
Arithmetic	1.25 ± 0.08
Length Weighted	2.37 ± 0.06
Weight Weighted	2.86 ± 0.08
P < 0.20 mm, %	30.20 ± 2.78
Coarseness, mg/m	0.118 ± 0.019
Mean Curl	0.111 ± 0.006
Kink Index	1.458 ± 0.047

KAJAANI FS-200	
Arithmetic	1.27 ± 0.04
Length Weighted	2.34 ± 0.03
Weight Weighted	2.83 ± 0.03
P < 0.20 mm, %	23.78 ± 1.77
Coarseness, mg/m	0.147 ± 0.026

DISINTEGRATION: Processed according to PAPTAC Standard C.10P using a two (2) litre container at 1.2% consistency. Data based on 63 runs. (113 runs for Kajaani FS-200 measurements; 144 runs for FQA measurements; 63 runs for FQA Kink measurements)

PFI beaten pulp properties

REV'S	CSF, mL	BULK (1-ply) cm ³ /g	BURST INDEX kPa.m ² /g	TEAR INDEX mN.m ² /g	BREAKING LENGTH, km
1000	625 ± 15	1.73 ± 0.06	5.01 ± 0.42	21.46 ± 2.59	6.79 ± 0.56
4000	505 ± 19	1.57 ± 0.05	8.29 ± 0.46	12.44 ± 1.02	10.30 ± 0.61
7000	381 ± 24	1.53 ± 0.05	9.23 ± 0.44	11.16 ± 0.66	11.32 ± 0.50
11000	241 ± 26	1.51 ± 0.04	9.81 ± 0.41	10.64 ± 0.72	12.02 ± 0.54

PFI MILL: Processed according to PAPTAC Standard C.7 using a two (2) litre container at 1.2% consistency. Data based on 36 runs.

FOR ORDERING AND GENERAL INFORMATION

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Methods

Chemical Properties

CARBOHYDRATES: Determined as alditol acetate derivatives by gas chromatography.

A 0.10g sample of air-dried pulp was subjected to a two-step (primary and secondary) hydrolysis procedure similar to that described by Borchard and Piper (1). Primary hydrolysis was done with 1.0 mL of 72% sulphuric acid for 45 min at 30±1°C. The hydrolyzate was then diluted with 28 mL of water and heated in an autoclave for 1 hr at 121°C (15psi). At the end of the hydrolysis period, the sample was cooled to room temperature and neutralized to pH 5.6-6.1 with concentrated NH₄OH, transferred to a 50 mL volumetric flask and diluted to volume with water. It was then centrifuged until the supernatant liquid was clear.

Reduction, acetylation and extraction of monosaccharides were carried out according to the method of Harris et al. (2) as follows:

Reduction: A 200 µL aliquot of the supernatant liquid was pipetted into a 20 mL test tube. One mL of sodium borohydride solution was added and the mixture incubated in a temperature block for 90 minutes at 40°C. Excess sodium borohydride was decomposed by adding 100 µL of 18M acetic acid.

Acetylation: This operation must be performed in a fumehood. Two hundred µL of 1-methylimidazole, followed by 2 mL of acetic anhydride was added to the reduced sample, the mixture was shaken and allowed to stand for 15 minutes at room temperature. Five mL deionized water was then added to decompose the excess acetic anhydride.

Extraction: After cooling, 1 mL dichloromethane was added and the sample was mixed on a vortex mixer. After standing for a few minutes, the bottom layer was transferred to a 1.5 mL vial using a pasteur pipette.

Gas chromatography: 1 µL of extracts was injected into a Hewlett-Packard 5890 gas chromatograph equipped with a DB-225 capillary column (30 m x 0.25 mm I.D., 0.25 µm film thickness, J & W Scientific, Folsom, CA, USA) and a flame ionization detector under the following conditions: high-purity helium was used as carrier and detector make-up gas; carrier gas flow-rate was 1.5 mL/min; injector and detector temperatures were 230°C, oven temperature program, 220 to 235°C at 1°C/min, hold 2 min; injector mode: split injection (20:1). Total run time was 17 min and chromatographic data were collected and printed using a Hewlett-Packard Chemstation.

The percentage of each polysaccharide was determined as described in TAPPI T249cm-85. Conversion factors for monosaccharide to polysaccharide were 0.88 for pentoses and 0.90 for hexoses.

(1) L.G. Borchardt and C.V. Piper, Tappi J., 53 (1970) 257.

(2) P.J. Harris, A.B. Blakeney, R.J. Henry and B.A. Stone, J. Assoc. off. Anal. Chem., 71 (1988) 272.

KAPPA NUMBER: Determined according to PAPTAC Standard G.18.

ACETONE EXTRACTIVES: Determined by Soxhlet extraction as described in PAPTAC Standard G.13 and G.20.

ASH: Determined by ashing the sample at 575°C, according to PAPTAC Standard G.10.

SULPHUR AND METALS: Determined by wet ashing the sample with nitric and perchloric acids, according to PAPTAC Standard G.30, followed by dilution of the sample, and analysis by Inductively Coupled Plasma (ICP) spectrometry.

Related Information

Physical Properties

PULP PREPARATION: The test specimen should be hand torn into pieces approximately 12 mm square. Cutting the sample, or the use of cut edges, must be avoided as this can affect the physical properties. A minimum of four (4) hours soaking time in distilled or deionized water at room temperature is required prior to pulp disintegration.

DISINTEGRATION FOR UNBEATEN PULP PROPERTIES: Ten (10) minutes in distilled or deionized water at 1.2 % consistency (24.00 ± 0.25 g o.d. in 2000 ± 20 mL) in a Standard Disintegrator. The data for the ten (10) minute disintegration is to be taken as 0 beating time for the PFI mill.

CANADIAN STANDARD FREENESS (CSF): The test is to be carried out with distilled or deionized water. For improved accuracy, all CSF values were obtained by weight rather than volume.

PROCEDURE FOR COARSENESS: After disintegration transfer 1.0 g (O.D.) of pulp to a suitable container, dilute to 2 L with water, and accurately determine the consistency according to PAPTAC Standard D.16. For the Kajaani FS-200, transfer (to the nearest 0.0001 g) the equivalent of 0.006 - 0.012 g (O.D.), for the FQA, transfer (to the nearest 0.0001 g) the equivalent of 0.001 g (O.D.) of pulp, to the sampling station of the fibre length analyser using a pipette with a tip opening diameter of at least 2 mm, and the entire suspension, agitated continuously, is passed through the analyser. From a knowledge of the total fibre mass and the total fibre length, the coarseness (mg/m) can then be determined.

PFI: For each beating level, disintegrate the pulp sample (24.00 ± 0.25 g (O.D.) in 2000 ± 20 mL) for fifteen (15) minutes prior to beating. Beating is to be carried out with distilled or deionized water. After beating and before freeness determination and handsheet preparation, disintegrate the pulp in 2000 ± 20 mL of water for five (5) minutes in a Standard Disintegrator.

TEST DATA: For each test in Tables I and II, the mean and twice the standard deviation are shown. About five (5) tests in one hundred (100) will fall outside plus or minus twice the standard deviation.

Additional notes:

- The quality of the water can adversely affect the freeness and handsheet test results. Distilled or deionized water must be used as stated. Tap water is not recommended.

- Pulp preparation, handsheet making and testing were carried out in accordance with PAPTAC Standard Methods. In order to reproduce the above results, laboratories must ensure that the procedures stated above are strictly adhered to, and that all testing equipment is properly maintained and calibrated.