

TR19. 16A. 166

R.677. Production of clays for paper-making from kaolin from north-eastern Tasmania.

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Associated Pulp & Paper Mills Ltd submitted a composite sample of hall-site-free clays from four bore holes from an area in north-eastern Tasmania.

The company requested that filler and coating clays be produced from the sample, Reg. No. 737443.

The sample was composed of lumps of kaolin and quartz particles together with minor amounts of iron-stained quartz particles.

SIZING ANALYSIS

An approximate sizing analysis of the sample as received was as follows:

Method	Particle size (µm)	% Mass	Cum. % Mass
Wet and dry sieve	-9530 +4750	1.4	1.4
	-4750 +2360	10.4	11.8
	-2360 +1180	12.6	24.4
	-1180 +600	9.9	34.3
	-600 +300	8.1	42.4
	-300 +150	5.3	47.7
	-150 +75	3.5	51.2
	-75 +38	2.8	54.0
Cyclosizer	-38 +33	0.2	54.2
	-33 +23	1.0	55.2
	-23 +14	2.0	57.2
	-14 +12	2.2	59.4
	-12 +8	0.6	60.0
Bouyoucos hydrometer	-8 +6	1.5	61.5
	-6 +4	5.0	66.5
	-4 +2	7.5	74.0
	-2 +1	8.5	82.5
	-1	17.5	100.0
Head		100.0	

The density of the -38 µm material was found to be 2.65 t/m³.

TEST WORK

The sample (at approximately 30% solids) was agitated in a Denver conditioner for 5 minutes prior to screening on a Sweco multi-deck vibrating screen fitted with the following screens:

- | | |
|-------------|------------|
| (1) 1190 µm | (3) 150 µm |
| (2) 590 µm | (4) 53 µm |

The -53 µm material was pumped at 17% solids to an 30 mm cyclone fitted with a 6 mm diameter vortex finder and a 4 mm diameter orifice.

TEST RESULTS

A Bouyoucos hydrometer particle size analysis of the cyclone overflow

produced gave the following results:

Particle size (μm)		% Mass	Cum. % Mass
-28	+18	2	2
-18	+12	3	5
-12	+8	5.5	10.5
-8	+6	5.5	16
-6	+4	9	25
-4	+2	17	42
-2	+1	16	58
-1		42	100
Head N1 Cyclone O/F		100	-

A cyclosizer particle size analysis of the cyclone overflow produced gave the following results.

Fraction	Particle size (m)	% Mass	% Grit	Loss on ignition	Grit distribution %	Brightness (Tappi scale)				
C/S1	-53 +43	0.20	87.1	-	6.1	-				
C/S2	-43 +33	0.20								
C/S3*	-33 +23	1.63					64.7	-	18.3	24.4
C/S4*	-23 +14	3.47					35.4	-	21.3	45.7
C/S5	-14 +12	3.88					19.7	9.91	13.3	59.0
O/F	-12	90.62	2.6	13.0	41.0	100.0	78.5			
Head		100.0	(5.8)	-	100.0	-				
Head assay		100.0	6.0	12.4	-	-	78.0			

*Iron-stained quartz was present in these fractions.

Flotation of the cyclone overflow in a Denver laboratory flotation cell with the addition of pine oil with a conditioning time of 2 minutes and a flotation time of 6 minutes gave the following results:

Fraction	% Mass	% Grit	% Loss on ignition	Brightness (Tappi scale)
F/C	27.5	5.6	12.6	78.5
F/T	72.5	6.2	12.4	78.0
Head	100.0	(6.0)	(12.5)	(78.1)

Flotation with the addition of 1090 g/t of pine oil and 730 g/t of fuel oil for a conditioning time of 3 minutes and a flotation time of 6 minutes gave the following results:

Fraction	% Mass	Brightness (Tappi scale)
F/C	25.0	76.5
F/T	75.0	77.5
Head	100.0	(77.3)

Flotation under the conditions stated did not remove or provide any concentration of organic material.

Bleach tests

Four separate samples of cyclone overflow pulp were placed in sodium hypochlorite solution and agitated for 5 hours at room temperature. The sodium hypochlorite solution used was produced by I.C.I. and contained 10.7 g of available chlorine per litre of solution. After bleaching, the clay was filtered, washed and dried, giving the following results:

Quantity of chlorine added to clay (g/t)	Brightness (Tappi scale)
40	78.0
170	78.0
450	78.0
1780	77.5
Head	78.0

Under the conditions used the brightness of the clay was not improved by the use of sodium hypochlorite solution as a bleach.

CONCLUSION

The composite samples contained approximately 46% of -30 µm material, 40.5% of -12 µm material and 26% of -2 µm material.

The -12 µm fraction of the composite sample contained 2.7% grit, had a loss on ignition of 12.3% and a brightness of 78.5

The cyclone overflow produced was acceptable in brightness (78.0) but was far too high in grit content (6%) for use as filler clay. The small amount of the sample prevented recycling and possible grit removal. A sizing analysis of this product indicated that it was composed of nominally -30 µm material: 0.4% +33 µm (cyclosizer), 0.0% +28 µm (Bouyoucos hydrometer). A yield of approximately 40% -30 µm material could be expected in a commercial operation.

The organic matter present which is thought to have coloured the clay to some extent was not removed or concentrated by flotation.

The brightness of the clay has not been improved by the use of concentrations of 40-1780 g of chlorine per tonne of clay.

No attempt was made to produce a coating clay due to the unavailability of a pilot plant scale centrifuge.

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1780	77.5
Head	78.0