

TR6-205-208

R. 388

CORNWALL COAL COMPANY

REJECT FINES FROM THE FINGAL WASHERY

Sample

Approximately 40 gallons of fine coal slurry was received from the Cornwall Coal Company, Launceston. The sample was overflow from the settling cone at the company's washery at Fingal.

The slurry contained 18% solids. Specific gravity of the solids in the slurry was 1.6.

Sizing

	Mesh B.S. Screen	Percent Weight	Ash
Plus 60	1.5	} 16.5
Plus 85	3.0	
Plus 100	1.8	
Plus 150	6.2	
Plus 200	4.4	
Plus 350	10.0	} 42.4
Minus 350	73.1	
Composite	100.0	35.4

Investigation

The washery settling cone overflow is a waste product, and is deposited in dams for settlement and natural drying. Present rate of production exceeds drying capacity of the dams. The company requested preliminary tests directed at reducing the quantity of solids sent to the main settling dam.

Summary

Preliminary tests were carried out on a sample of coal slurry from the Fingal washery of the Cornwall Coal Mining Company. The tests involved cycloning, settlement, flotation or filtration. Object of the tests was to suggest a method where the quantity of solids being sent to the settling dams could be reduced.

The fineness of the feed and the low specific gravity of the solids make cycloning, filtration or settlement difficult. A reasonably thick cyclone underflow can be obtained, but the underflow contains less than one fifth of the total solids. Filtration rates are very slow, probably due to the presence of appreciable clay-like slimes. Flotation results in the production of a product that should be saleable, but the installation of the flotation and dewatering plant does not appear justified due to the present depressed state of the industry.

The company is currently investigating prior removal of the minus $\frac{1}{4}$ -inch fines by dry screening ahead of the washery. This would markedly decrease the quantity of fines requiring dam settlement.

Hydrocyclone Tests

The quantity of solids sent to the main dam could be reduced by cycloning if the cyclone underflow was sufficiently viscous to allow it to be carted by motor truck alone or with reject shale.

Cyclone tests were carried out with a 3" Warman rubber lined cyclone, fed with a 1 $\frac{1}{3}$ " split case Warman pump with variable speed motor. The following conditions were held constant for the series below.

Vortex finder diameter $\frac{1}{4}$ -inch.
Cyclone feed pressure 45 lbs./sq.in.
Feed density 18% solids.

Test No.	Diameter Underflow Spigot	Product	Proportion of Total Solids	Pulp Density Percent solids	Sizing Percent	
					Plus 350 Mesh	Minus 350
R.388/1	3"	Overflow	65.7	15	4.8	95.2
		Underflow	34.3	32	65.3	34.7
		Composite	100.0	18	25.5	74.5
R.388/2	3"	Overflow	73.7	13	11.9	88.1
		Underflow	26.3	49	73.3	26.7
		Composite	100.0	18	28.0	72.0
R.388/3	3/16"	Overflow	81.2	15	14.7	85.3
		Underflow	18.8	54	76.8	23.2
		Composite	100.0	18	26.4	73.6

In test R.383/3 a cyclone underflow with a high pulp density (54% solids) was obtained, but only 18.8% of the solids in the feed was recovered in the underflow. Tests R.388/1 and 2 show how the pulp density of the underflow decreases as the recovery of solids in the underflow increases.

A further series of tests showed that variation of the cyclone feed pressure had little effect on the cyclone separation.

Tests were also carried out involving recycling in a 30 mm cyclone the cyclone overflow produced under conditions of Test R.388/3 (see above). High density underflows were not obtained from the 30 mm cyclone separations.

Settlement Tests

Preliminary settlement tests were carried out to determine if settlement or thickening to pulps of high pulp density would be practicable. Flocculants used were aluminium sulphate and polyfloc (the latter being supplied by Mr. Widdowson).

Test No.	Period of Settlement: Hours	Pulp Density of Feed % Solids	Flocculant Added: 20 lbs./ton	Thickened Pulp	
				Pulp Density % Solids	% Solids Recovered
R.388/11	24	18	Nil	30	99
R.388/12	48	18	Nil	33	99
R.388/13	72	18	Alum. Sulphate	20	100
R.388/14	72	18	Polyfloc	26	100
R.388/15	72	3.7	Polyfloc Alum.	26	100
R.388/16	72	3.7	Sulphate	23	100

These tests indicate that pulps containing 30-33% solids could be attained by settlement or thickening.

Material settled without flocculants had a higher solids content than material settled with flocculants.

Flotation

By flotation, it would be possible to float a comparatively low ash coal which could be a saleable product, leaving the shale fines only to be sent to dams.

Several flotation tests were carried out using 14-16 lb./ton of kerosene or fuel oil. A little cresylic acid was used as a frother. The tests were carried out mainly to allow the flotation products to be examined, and no attempt was made to determine optimum reagent usage. Results of all tests were similar. A typical test is detailed below:—

	Percent		Percent Distribution	
	Weight	Ash	Ash	
Coal concentrate	69.1	22.5	45	
Flotation tailing	30.9	61.9	55	
Composite	100.0	34.7	100	

The flotation tailing is coal free, and appears to be essentially clay and clay-like slimes.

The coal concentrate has a comparatively low ash content, and could be a saleable product. However, due to the depressed state of the coal mining industry, it would be difficult to justify the capital outlay for the flotation and dewatering equipment. In addition some buyers impose penalties for excessive fines and moisture.

The flotation coal concentrate filters reasonably well.

Filtration

Preliminary filtration tests were carried out on the slurry as received. Several flocculants including separan, polyfloc and aluminium sulphate were tested. Good filtration rates were not attained in any test. The flotation tailings appear to consist essentially of fine clays, and this probably is the cause of the poor filtration rates.

Centrifuging

Centrifuging test work was carried out, but dewatering by centrifuging would appear to offer good prospects of a satisfactory method of disposing of the slurry.

Dry Screening

After the above preliminary tests had been carried out, the Cornwall Coal Company decided to investigate removal of the minus $\frac{1}{4}$ " material by dry screening. Samples taken and sized by the company had the following characteristics calculated, on a moisture free basis.

Reg. No.	Sample	Calorific Value B.Th.Units	Ash Content Percent
1424	— $\frac{1}{4}$ " + $\frac{1}{8}$ " material	10,310	25.8
1425	— $\frac{1}{8}$ " material	10,220	26.6
1426	Weighted composite	10,260	26.4

The company considered that the minus $\frac{1}{4}$ " material could be a saleable product to a customer using pulverized coal. The company will investigate this suggestion.

Removal of the bulk of the minus $\frac{1}{4}$ " material by dry screening, ahead of washery operation should greatly decrease the amount of fines to be sent to the settling dams.