TR3-172-181 R. 346

CORNWALL COAL COMPANY

SINK-FLOAT BENEFICIATION TESTS.

Sample.

A sample of coal weighing 952 lbs. was received from the Cornwall Coal Co. The company stated that the sample was produced during one week sampling period when production from the Cornwall mine amounted to 2,500 tons. The sample represents about 90% of the production, and does not include the plus four inch large coal. The large coal was removed by a screen, and the sample submitted has not been crushed.

Sizing.

Size	Percent Weight
— 4″ + 3″	1.3
— 3″ + 2″	14.4
— 2″ + 1¼″	21.4
— 1¼″ + ⅜″	25.8
— ⅜″ + ¼″	20.0
— ¼″	17.1

The analysis of the sample on a moisture free basis was:

Ash	23.5 percent
B. Th. Units	10,600

No responsibility is accepted for the results shown in this report except in so far as they apply to the samples tested.

The moisture contents in the various fractions ranged from 3 to 6.5 percent, but all the results reported are shown on a moisture free basis.

Investigation.

Sink-float separations were made at specific gravities ranging from 1.4 to 1.9 in 0.1 steps down to plus 30 mesh coal. Minus 30 mesh coal was not treated.

Summary.

1. Sink-float tests were undertaken separately on all sizings down to plus 30 mesh B.S. size, and the results of this work are shown in full in the tables. The following abbreviated tables show the major features of commercial value.

Coal Product	Percent Wgt.	Ash	B.Th.U's
No Beneficiation	100	23.5	10,600
Float at 1.6	86.1	18.1	11,460
Float at 1.8	93.8	20.3	11,070

The quantities floated at 1.6 and 1.8 specific gravities shown above include 4.0% by weight of minus 30 mesh untreated coal containing 27.8 % of ash.

The rejects at the densities were as follows:—

Coal Product	Percent Wgt.	Ash
Reject at 1.6	13.9	57.2
Reject at 1.8	6.2	73.4

2. The quantities of coal floated at each density and the cumulative quantities and qualities are shown below. The details of minus 30 mesh untreated coal and sink reject at 1.9 are also shown.

Coal Product	Individual Fractions Percent		Cumulative Fractions Percent	
	Wgt.	Ash	Wgt.	Ash
Float at 1.4	46.3	12.2	46.3	12.2
Float at 1.5	25.1	21.4	71.4	15.4
Float at 1.6	10.7	32.1	82.1	17.6
Float at 1.7	5.2	41.3	87.3	19.0

Coal Product	Individual Fractions Percent		Cumulative Fractions Percent	
	Wgt.	Ash	Wgt.	Ash
Float at 1.8	2.5	50.2	89.8	19.9
Float at 1.9	1.1	58.0	90.9	20.3
Minus 30 mesh untreated	4.0	27.8	94.9	20.7
Sink at 1.9	5.1	76.6	100.0	23.5

Proximate analysis of coal floated at 1.6 and 1.8. In each case the minus 30 mesh untreated coal is included.

	Float at 1.6	Float at 1.8
V.C.M.	28.1 percent	27.3 percent
F.C.	53.8 percent	52.5 percent
Ash	18.1 percent	20.2 percent
S.	0.37 percent	0.33 percent
B.Th.U's.	11,460	11,070

Test Results.

Sink-Float Tests from 1.4 to 1.9 Specific Gravities

Product	Size	Individual Fractions Percent Wgt.	Individual Fractions Percent Ash	Cumulative Fractions Percent Wgt.	Cumulative Fractions Percent Ash
Float at 1.4	— 4″ + 2″	8.6	13.4		
	— 2″ +1¼″	10.9	13.5		
	—1¼″ + ¾″	12.1	12.7		
	— ¾″ + ¼″	9.4	11.4		
	— ¼″ +30 mesh	5.3	7.6		
Total Float at 1.4		46.3	12.2	46.3	12.2
Float at 1.5	— 4″ + 2″	4.7	22.7		
	— 2″ + 1¼″	6.0	22.4		
	— 1¼″+ ¾″	7.1	21.2		
	— ¾″ + ¼″	4.1	21.1		
	— ¼″ +30mesh	3.2	18.8		
Total Float at 1.5		25.1	21.4	71.4	15.4
Float at 1.6	— 4″ + 2″	1.5	32.5		
	— 2″ +1¼″	2.3	32.7		
	—1¼″ + ¾″	3.1	32.6		
	— ¾″ + ¼″	2.4	31.0		
	— ¼″ +30mesh	1.4	31.4		
Total Float at 1.6		10.7	32.1	82.1	17.6
Float at 1.7	— 4″ + 2″	0.4	42.0		
	— 2″ +1¼″	1.1	41.4		
	—1¼″ + ¾″	1.7	41.7		
	— ¾″ + ¼″	1.4	41.3		
	— ¼″ +30 mesh	0.6	39.3		
Total Float at 1.7		5.2	41.3	87.3	19.0

Product	Size	Individual Fractions Percent Wgt.	Ash	Cumulative Fractions Percent Wgt.	Ash
Float at 1.8	— 4″ + 2″	0.2	50.7		
	— 2″ +1¼″	0.4	50.9		
	—1¼″ + ⅜″	0.6	50.5		
	— ⅜″ + ¼″	0.8	51.3		
	— ¼″ +30 mesh	0.5	47.2		
Total Float at 1.8		2.5	50.2	89.8	19.9
Float at 1.9	— 4″ + 2″	Nil	....		
	— 2″ +1¼″	0.1	56.9		
	—1¼″ + ⅜″	0.2	57.0		
	— ⅜″ + ¼″	0.5	60.3		
	— ¼″ +30 mesh	0.3	54.9		
Total Float at 1.9		1.1	58.0	90.9	20.3
—30 mesh untreated		4.0	27.8	94.9	20.7
Sink at 1.9	— 4″ + 2″	0.2	73.3		
	— 2″ +1¼″	0.6	80.4		
	—1¼″ + ⅜″	1.1	77.4		
	— ⅜″ + ¼″	1.4	78.4		
	— ¼″ +30 mesh	1.8	73.9		
Total Sink at 1.9		5.1	76.6	100.0	23.5
Total Coal		100.0	23.5		

Minus ¼″ Fraction Sink-Float at 30 Mesh B.S.

Product	Percent Wgt.	Ash
Float at 1.4	5.3	7.6
Float at 1.5	3.2	18.8
Float at 1.6	1.4	31.4
Float at 1.7	0.6	39.3
Float at 1.8	0.5	47.2
Float at 1.9	0.3	54.9
—30 mesh untreated	4.0	27.8
Sink at 1.9	1.8	73.9
Composite	17.1	26.4

Sink-Float at 2.1

Sink-float test was extended from 1.9 to 2.1 specific gravity on the minus ⅜ + ¼″ fraction of sink at 1.9 with the following results.

Minus ⅜ plus ¼ Sink at 1.9

Product	Percent Wgt.	Ash
Float at 2.0	0.1	64.6
Float at 2.1	0.2	69.5
Sink at 2.1	1.1	81.2
Composite	1.4	78.4

Comparison of Washability Tests.

R. 325. Cornwall No. 1 Seam. February, 1958. 306 lbs. sample weight.
R. 327. Cornwall No. 2 Seam, February, 1958, 228 lbs. sample weight.
R. 328. Duncan Colliery, February, 1958. 382 lbs. sample weight.
R. 346. Cornwall No. 1 Seam, September, 1958, 952 lbs. sample weight.

Individual Fractions—percent

	R. 325		R. 327		R. 328		R. 346	
	Wgt.	Ash	Wgt.	Ash	Wgt.	Ash	Wgt.	Ash
Float at 1.4	52.4	12.0	46.7	12.2	54.2	13.6	46.3	12.2
Float at 1.5	18.1	23.6	25.0	21.7	23.4	23.5	25.1	21.4
Float at 1.6	7.4	32.5	9.0	31.4	8.2	33.6	10.7	32.1
Float at 1.7	1.4	41.6	5.0	39.0	3.0	44.0	5.2	41.3
Float at 1.8	1.0	49.2	3.2	47.7	1.7	52.6	2.5	50.2

Cumulative Fractions—percent.

	R. 325		R. 327		R. 328		R. 346	
	Wgt.	Ash	Wgt.	Ash	Wgt.	Ash	Wgt.	Ash
Float at 1.4	52.4	12.0	46.7	12.2	54.2	13.6	46.3	12.2
Float at 1.5	70.5	15.0	71.7	15.5	77.6	16.6	71.4	15.4
Float at 1.6	77.9	16.6	80.7	17.3	85.8	18.2	82.1	17.6
Float at 1.7	79.3	17.1	85.7	18.6	88.8	19.1	87.3	19.0
Float at 1.8	80.3	17.5	88.9	19.6	90.5	19.7	89.8	19.9

R. 347

CORNWALL COAL COMPANY

DUNCAN COLLIERY

SINK-FLOAT BENEFICIATION TESTS.

Sample.

A sample of coal weighing 1104 lbs. was received from the Cornwall Coal Co. The coal was stated to be run of mine after single roll crushing to nominally minus 3 inch size. The sample represents total colliery production of the week ending 1st August, 1958, and for four days ending the 13th August, 1958. Production during these periods amounted to 2,200 tons.

Sizing.

Size	Percent Weight
— 4″ + 3″	1.4
— 3″ + 2″	12.2
— 2″ + 1¼″	31.5
—1¼″ + ¾″	24.6
— ¾″ + ¼″	15.8
— 4″	14.5

The analysis of the sample on a moisture free basis was:—

Ash	23.3 percent
B.Th. Units	10,740

No responsibility is accepted for the results shown in this report except in so far as they apply to the samples tested.

The moisture contents in the various fractions ranged from 3 to 7 percent, but all the results shown in the report are on a moisture free basis.

Investigation.

Sink-float tests were made at specific gravities ranging from 1.4 to 1.9 in 0.1 steps down to plus 30 mesh coal. The minus 30 mesh coal was not treated.

Summary.

1. Sink-float tests were undertaken separately on all sizings down to plus 30 mesh B.S. size, and the results of this work are shown in full in the tables.

The following abbreviated tables show the major features of commercial value. The quantities shown floated at 1.6 and 1.8 include the minus 30 mesh untreated which amounted to 4 percent by weight, and contained 25.6 percent of ash.

Coal Product	Percent Wgt.	Ash	B. Th. Units
No Beneficiation	100	23.3	10,740
Float at 1.6	91.8	20.0	11,220
Float at 1.8	96.2	21.3	11,030

The rejects at the densities were as follows:—

	Percent Wgt.	Ash
Reject at 1.6	8.2	60.1
Reject at 1.8	3.8	74.5

2. The quantities of coal floated at each density, and the cumulative quantities and qualities are shown below. The details of minus 30 mesh untreated coal and sink reject at 1.9 density are also shown.

Coal Product	Individual Fractions Percent Wgt.	Ash	Cumulative Fractions Percent Wgt.	Ash
Float at 1.4	45.8	14.7	45.8	14.7
Float at 1.5	30.2	22.7	76.0	17.9
Float at 1.6	11.8	31.7	87.8	19.8
Float at 1.7	2.9	44.3	90.7	20.5
Float at 1.8	1.5	54.0	92.2	21.1
Float at 1.9	0.6	60.8	92.8	21.3
Minus 30 mesh untreated	4.0	25.6	96.8	21.5
Sink at 1.9	3.2	77.0	100.0	23.3

Proximate analysis of coal floated at 1.6 and 1.8, including in each case the minus 30 mesh untreated coal.

	Float at 1.6	Float at 1.8
V.C.M.	26.1	25.6
F.C.	53.9	52.9
Ash	20.0	21.3
S	0.37	0.34
B.Th. Units	11,220	11,030

Test Results.

Sink-Float Tests from 1.4 to 1.9 Specific Gravities

Product	Size	Individual Fractions Percent Wgt.	Individual Fractions Percent Ash	Cumulative Fractions Percent Wgt.	Cumulative Fractions Percent Ash
Float at 1.4	— 4″ + 2″	7.4	16.8		
	— 2″ +1¼″	16.2	15.5		
	—1¼″ + ¾″	11.7	14.3		
	— ¾″ + ¼″	6.9	13.8		
	— ¼″ +30 mesh	3.6	9.9		
Total Float at 1.4		45.8	14.7	45.8	14.7
Float at 1.5	— 4″ + 2″	3.7	23.3		
	— 2″+1¼″	9.7	23.8		
	—1¼″ + ¾″	8.0	22.9		
	— ¾″ + ¼″	4.9	22.6		
	— ¼″ +30 mesh	3.9	19.5		
Total Float at 1.5		30.2	22.7	76.0	17.9
Float at 1.6	— 4″ + 2″	1.7	31.3		
	— 2″ +1¼″	3.2	32.4		
	—1¼″ + ¾″	2.9	32.9		
	— ¾″ + ¼″	2.4	31.3		
	— ¼″ +30 mesh	1.6	29.4		
Total Float at 1.6		11.8	31.7	87.8	19.8
Float at 1.7	— 4″ + 2″	0.4	45.6		
	— 2″ +1¼″	0.9	44.9		
	—1¼″ + ¾″	0.7	45.2		
	— ¾″ + ¼″	0.5	45.2		
	— ¼″ +30 mesh	0.4	39.6		
Total Float at 1.7		2.9	44.3	90.7	20.5
Float at 1.8	— 4″ + 2″	0.2	55.8		
	— 2″ +1¼″	0.3	55.4		
	—1¼″ + ¾″	0.3	55.3		
	— ¾″ + ¼″	0.4	54.2		
	— ¼″ +30 mesh	0.3	49.6		
Total Float at 1.8		1.5	54.0	92.2	21.1

Product	Size	Individual Fractions Percent Wgt.	Ash	Cumulative Fractions Percent Wgt.	Ash
Float at 1.9	— 4" + 2¼	Nil	Nil		
	— 2" +1¼"	0.1	62.6		
	—1¼" + ¾"	0.2	61.1		
	— ¾" + ¼"	0.2	61.1		
	— ¼" +30 mesh	0.1	58.4		
Total Float at 1.9		0.6	60.8	92.8	21.3
—30 mesh untreated		4.0	25.6	96.8	21.5
Sink at 1.9	— 4" + 2"	0.3	72.8		
	— 2" +1¼"	0.8	76.5		
	—1¼" + ¾"	0.7	78.4		
	— ¾" + ¼"	0.8	79.9		
	— ¼" +30 mesh	0.6	74.5		
Total Sink at 1.9		3.2	77.0	100.0	23.3
Total Coal		100.0	23.3		

Minus ¼" Fraction Sink-Float to 30 Mesh B.S.

Product	Percent Wgt.	Ash
Float at 1.4	3.6	9.9
Float at 1.5	3.9	19.5
Float at 1.6	1.6	29.4
Float at 1.7	0.4	39.6
Float at 1.8	0.3	49.6
Float at 1.9	0.1	58.4
30 mesh untreated	4.0	25.6
Sink at 1.9	0.6	74.5
Composite	14.5	23.6

Sink-Float at 2.1

Sink-float tests were extended from 1.9 to 2.1 specific gravity on the minus ¾ inch plus ¼ inch fraction of sink 1.9 with the following results.

Product	Percent Wgt.	Ash
Float at 2.0	0.1	68.1
Float at 2.1	0.2	72.8
Sink at 2.1	0.5	85.0
Composite	0.8	79.9

Comparison of Washability Tests.

R. 325. Cornwall No. 1 Seam, February, 1958, 306 lbs. sample weight.

R. 327. Cornwall No. 2 Seam, February, 1958, 228 lbs. sample weight.

R. 328. Duncan Colliery, February, 1958, 382 lbs. sample weight.

R. 346. Cornwall No. 1 Seam, September, 1959, 952 lbs. sample weight.

R. 347. Duncan Colliery, September, 1958, 1104 lbs. sample weight.

Individual Fractions

Percent

Float at	R. 325		R. 327		R. 328		R. 346		R. 347	
	Wgt.	Ash	Wgt.	Ash	Wgt.	Ash	Wgt.	Ash	Wgt.	Ash
1.4	52.4	12.0	46.7	12.2	54.2	13.6	46.3	12.2	45.8	14.7
1.5	18.1	23.6	25.0	21.7	23.4	23.5	25.1	21.4	30.2	22.7
1.6	7.4	32.5	9.0	31.4	8.2	33.6	10.7	32.1	11.8	31.7
1.7	1.4	41.6	5.0	39.0	3.0	44.0	5.2	41.3	2.9	44.3
1.8	1.0	49.2	3.2	47.7	1.7	52.6	2.5	50.2	1.5	54.0

Cumulative Fractions

Percent

Float at	R. 325		R. 327		R. 328		R. 346		R. 347	
	Wgt.	Ash	Wgt.	Ash	Wgt.	Ash	Wgt.	Ash	Wgt.	Ash
1.4	52.4	12.0	46.7	12.2	54.2	13.6	46.3	12.2	45.8	14.7
1.5	70.5	15.0	71.7	15.6	77.6	16.6	71.4	15.4	76.0	17.9
1.6	77.9	16.6	80.7	17.3	85.8	18.2	82.1	17.6	87.8	19.8
1.7	79.3	17.1	85.7	18.6	88.8	19.1	87.3	19.0	90.7	20.5
1.8	80.3	17.5	88.9	19.6	90.5	19.7	89.8	19.9	92.2	21.1

R. 346 & R. 347

CORNWALL COAL COMPANY

APPENDIX 1.

Information in this appendix shows the chemical analyses, softening and fusion points of ashes of Cornwall and Duncan coal samples on which sink-float beneficiation tests were reported in September, 1958.

R. 346. Cornwall Coal.
R. 347. Duncan Coal.

The softening and fusion points of R. 347 float at 1.6 and sink at 1.6 are shown separately.

	R. 346	R. 347
	Percent	
SiO_2	54.82	54.47
Al_2O_3	36.36	28.28
Fe_2O_3	3.37	4.16
MnO	0.05	0.16
TiO_2	1.35	1.16
P_2O_5	0.04	0.04
CaO	2.00	6.69
MgO	0.72	1.11
Na_2O	0.30	0.38
K_2O	0.42	0.59
SO_3	0.86	2.85

	Softening Point	Fusion Point
R. 346	No change at	1500°C
R. 347	1320°C	Near fusion 1500°C
R. 347, float at 1.6	1230°C	Near fusion 1500°C
R. 347, sink at 1.6	No change at	1500°C

The temperature range between softening point and fusion point in R.347 is unusually long and difficult to interpret in practical terms. It is probable that Duncan coal would be used for the majority of commercial purposes in Tasmania without criticism in reference to fusion of ash.

The slight lowering of the softening point in the floated coal is considered to be caused by the fact the floated coal has a higher lime content.