K-FORDING RIVER 82(4) 7-2

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CONFIDENTIAL

APPENDIX 4

ADIT SAMPLE ANALYSES

i) Bulk Washability Tests - Birtley Report

GEOLOGICAL BRANCH
ASSESSMENT REPORT

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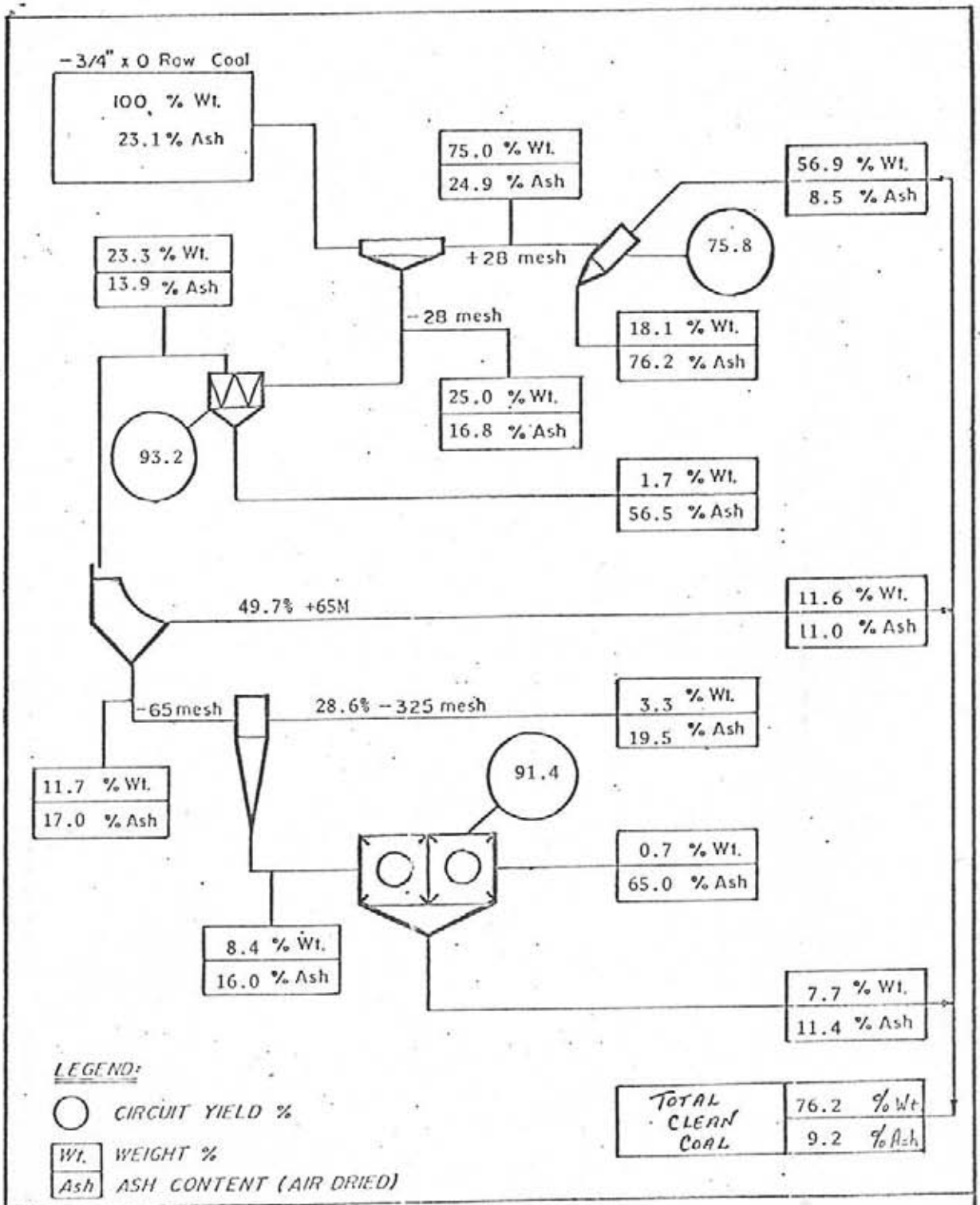


BIRTLEY COAL & MINERALS TESTING

Title PLANT BALANCE FLOW SHEET FORDING COAL LIMITED Adit 19, Seam 4 Upper Bulk Sample Lab No. 4095	Date December, 1982 Drawn

SUMMARY - BULK WASHING DATA *

Bulk Sample Seam 4 Upper Lab.No. 4093

Date Received December 6, 1982 Date Washed December 8, 1982

a) RAW COAL

Delivered Weight 4.052 MT Washed Weight 3.080 MT

ADM% 3.7 ASH% 23.1 FSI 4

b) HEAVY MEDIA CIRCUIT: 3/4" x 28 Mesh = 75.0 % by weight

S.G. of Medium 1.42 Calculated Yield = 75.8 %

SAMPLE	ASH%	F.S.I.
FEED	24.9	4
CLEAN COAL	8.5	7
REJECT	76.2	½

c) WATER-ONLY CYCLONE CIRCUIT: 28M x 0 = 25.0 % by weight

V.F.C. #1 = 4 cm #2 = 5 cm Calculated Yield = 93.2 %

SAMPLE	ASH%	F.S.I.
FEED	16.8	4
OVERFLOW	13.9	4
UNDERFLOW	56.5	1
S.B.O.	11.0	5½
S.B.U.	17.0	3

d) FROTH FLOTATION CIRCUIT: 65M x 0 = 11.7 % by weight

3:1 = Kerosene: M.I.B.C. Calculated Yield = 91.4 %

SAMPLE	ASH%	F.S.I.
T.C.O.	19.5	1
FEED (T.C.U.)	16.0	4
CONCENTRATE	11.4	5½
TAILINGS	65.0	0

e) FILTER CAKE: S.B.O. + CONCENTRATE = 11.3 ASH% 5½ FSI

* All weights and analysis are on an Air Dried Basis unless otherwise indicated.

Birtley Coal
& Minerals Testing

SUMMARY - BULK WASHING DATA (Cont.)

Bulk Sample Seam 4 Upper Lab.No. 4093

f) CLEAN COAL: H.M.C.C. + FILTER CAKE Calculated Yield 76.2 %

ADM	PROXIMATE				S%	CAL/GM	FSI	HGI	S.G.*
	RM%	ASH%	VM%	FC%					
7.6	0.4	9.2	21.4	69.0	0.39	7788	6½	111	1.38

DILATATION TEST				
ST(°C)	MDT(°C)	MC%	MD%	G
410	479	21	-8	0.918

GIESELER FLUIDITY TEST		
	DDPM	TEMP(°C)
START	1	446
MAXIMUM	5	482
FINAL	0	511
	RANGE	5

* S.G. - Apparent S.G. run on 3/4" x 0 coal

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

SUMMARY - BULK WASHING DATA (Cont.)

Bulk Sample Seam 4 Upper Lab.No. 4093

CLEAN COAL INVENTORY

DATE	SHIPPED		IN STOCK	
	BBLS	M.T.	BBLS	M.T.
December 10, 1982	--	--	15	2.273

Birtley Coal
& Minerals Testing

SUMMARY. - BULK WASHING DATA (Cont.)

Bulk Sample Seam 4 Upper Lab.No. 4093

HEAVY MEDIUM CIRCUIT

CYCLONE: 14" DSM operating @ 52 KPa

MAGNETITE MEDIUM maintained @ 1.42 S.G.

1.	FEED (3/4" x 28 Mesh)	2.309	M.T.	24.9	ASH%	4	FSI
2.	CLEAN COAL	1.732	M.T.	8.5	ASH%	7	FSI
3.	REJECT	0.577	M.T.	76.2	ASH%	1	FSI

4. YIELD CLEAN COAL (Weighted) $= \frac{1.732}{2.309} =$ 75.0 %

5. YIELD CLEAN COAL (Calculated) $= \frac{76.2 - 24.9}{76.2 - 8.5} =$ 75.8 %

Birtley Coal
& Minerals Testing

SUMMARY - BULK WASHING DATA (Cont.)

Bulk Sample Seam 4 Upper Lab.No. 4093

WATER - ONLY CYCLONE CIRCUIT

Primary Cyclone: 6" DSM operating @ 138 KPa

Vortex Finder Clearance set @ 4 cm

Secondary Cyclone: 4" DSM operating @ 35 KPa

Vortex Finder Clearance set @ 5 cm

Sieve Bend: 65 Mesh

1.	Feed (28 Mesh x 0)	16.8	ASH%	4	F.S.I.
2.	Primary Cyclone Overflow	13.9	ASH%	4	F.S.I.
3.	Secondary Cyclone Underflow	56.5	ASH%	1	F.S.I.
4.	Sieve Bend Overflow (S.B.O.)	11.0	ASH%	5½	F.S.I.
5.	Sieve Bend Underflow (S.B.U.)	17.0	ASH%	3	F.S.I.

6. Yield (W.O. Cyclone) $= \frac{56.5 - 16.8}{56.5 - 13.9} =$ 93.2 %

7. Wt% 28M x 65M in Primary Cyclone Overflow = 49.7 %

8. Estimated Yield of 28M x 65M (S.B.O., as % of 28M x 0 Feed) = 46.3 %

Birtley Coal
& Minerals Testing

SUMMARY - BULK WASHING DATA (Cont.)

Bulk Sample Seam 4 Upper Lab.No. 4093

FROTH FLOTATION CIRCUIT

Flotation Cell: two (2) Birtley-Humboldt Multi-Wobble impellers in series.

Reagent: 3:1 = Kerosene: M.I.B.C. , 21cc/minute

Thickening Cyclone: 20° - 8" cyclone Hayl-Patterson

1.	Thickening Cyclone Overflow (T.C.O. -325M)	19.5	ASH%	1	FSI
2.	Flotation Feed (Thickening Cyclone Underflow)	16.0	ASH%	4	FSI
3.	Concentrate	11.4	ASH%	5½	FSI
4.	Tailings	65.0	ASH%	0	FSI

5. Yield Concentrate = $\frac{65.0 - 16.0}{65.0 - 11.4}$ = 91.4 %

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT MENTSTEL INDUSTRIES LTD

CLIENT: FORDING COAL LIMITED
PROJECT: ADIT 19, SEAM 4 UPPER
LAB NO: 4093
DATE: DECEMBER 22, 1982

I. WASHABILITY DATA - HEAVY MEDIUM CYCLONE PRODUCTS for E.P.M.

S.G. FRACTION	PERCENT WEIGHT CLEAN COAL	PERCENT WEIGHT REJECT	PERCENT OF FEED CLEAN COAL	PERCENT OF FEED REJECT	CALCULATED FEED	MEAN S.G.	PARTITION COEFFICIENT
- 1.30	32.40	0.40	24.50	0.10	24.60	--	0.40
1.30 - 1.40	49.10	1.50	37.20	0.40	37.60	1.35	1.10
1.40 - 1.50	11.00	2.20	8.30	0.50	8.80	1.45	5.70
1.50 - 1.60	5.00	5.30	3.80	1.30	5.10	1.55	25.50
1.60 - 1.70	1.10	6.10	0.80	1.50	2.30	1.65	65.20
1.70 - 1.80	0.50	5.80	0.40	1.40	1.80	1.75	78.30
1.80 - 1.90	0.20	3.40	0.20	0.80	1.00	1.85	80.00
1.90 - 2.00	0.10	2.90	0.10	0.70	0.80	1.95	87.50
+ 2.00	0.60	72.40	0.50	17.50	18.00	--	97.20

II. WASHABILITY DATA - WATER-ONLY CYCLONE PRODUCTS for E.P.M.

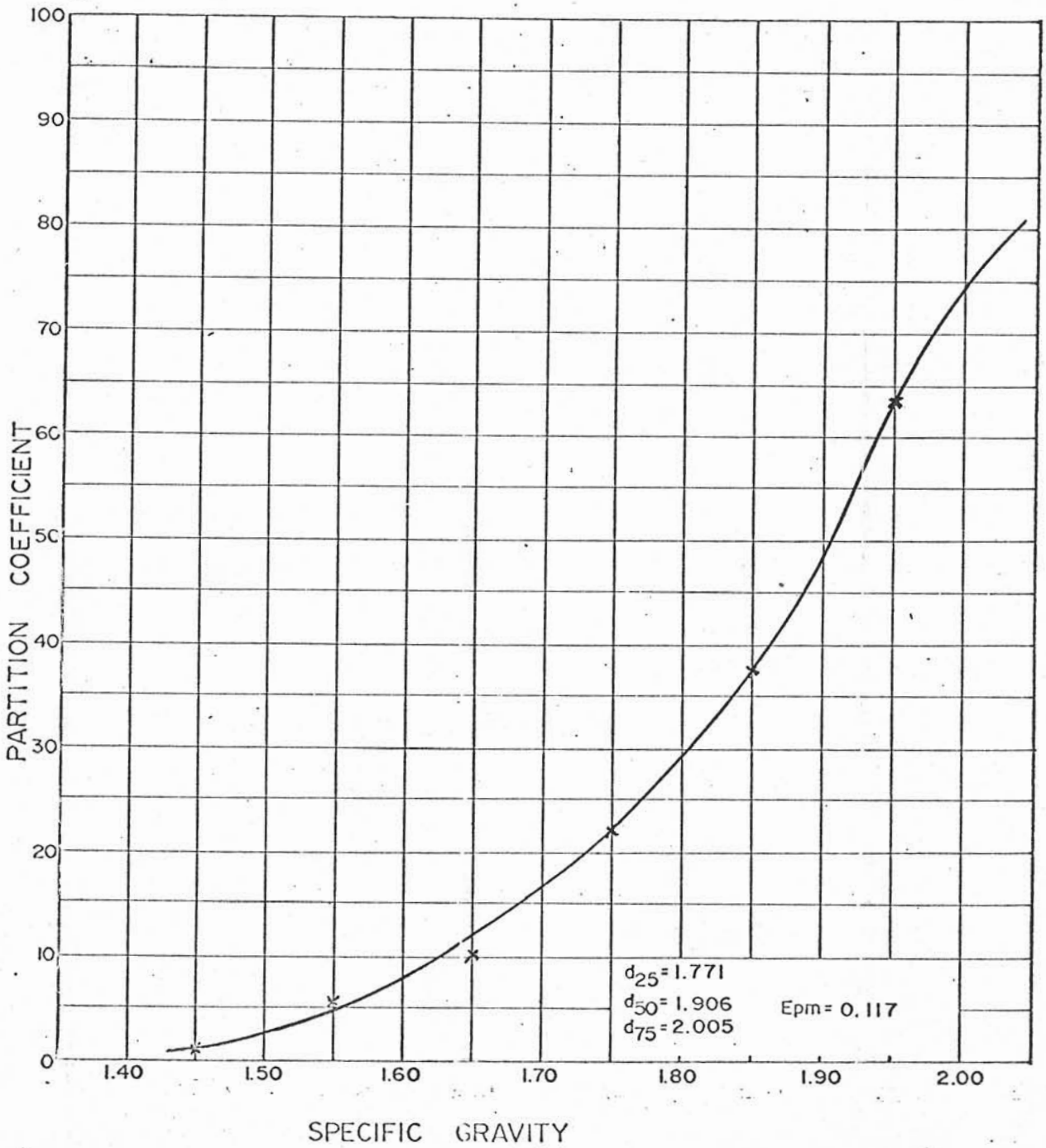
S.G. FRACTION	PERCENT WEIGHT OVERFLOW	PERCENT WEIGHT UNDERFLOW	PERCENT OF FEED OVERFLOW	PERCENT OF FEED UNDERFLOW	CALCULATED FEED	MEAN S.G.	PARTITION COEFFICIENT
- 1.30	19.30	0.60	18.00	--	18.00	--	--
1.30 - 1.40	40.00	2.00	37.30	0.10	37.40	1.35	0.30
1.40 - 1.50	21.90	3.30	20.40	0.20	20.60	1.45	1.00
1.50 - 1.60	9.60	7.20	8.90	0.50	9.40	1.55	5.30
1.60 - 1.70	4.80	8.20	4.50	0.50	5.00	1.65	10.00
1.70 - 1.80	2.20	8.40	2.10	0.60	2.70	1.75	22.20
1.80 - 1.90	1.10	8.60	1.00	0.60	1.60	1.85	37.50
1.90 - 2.00	0.40	9.60	0.40	0.70	1.10	1.95	63.60
+ 2.00	0.70	52.10	0.60	3.60	4.20	--	85.70

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

CLIENT: FORDING COAL LIMITED
SAMPLE: *W.O. Cyclone Products* - SEAM 4 UPPER

LAB NO. 4093
DATE: Dec. 1982

PARTITION CURVE



Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

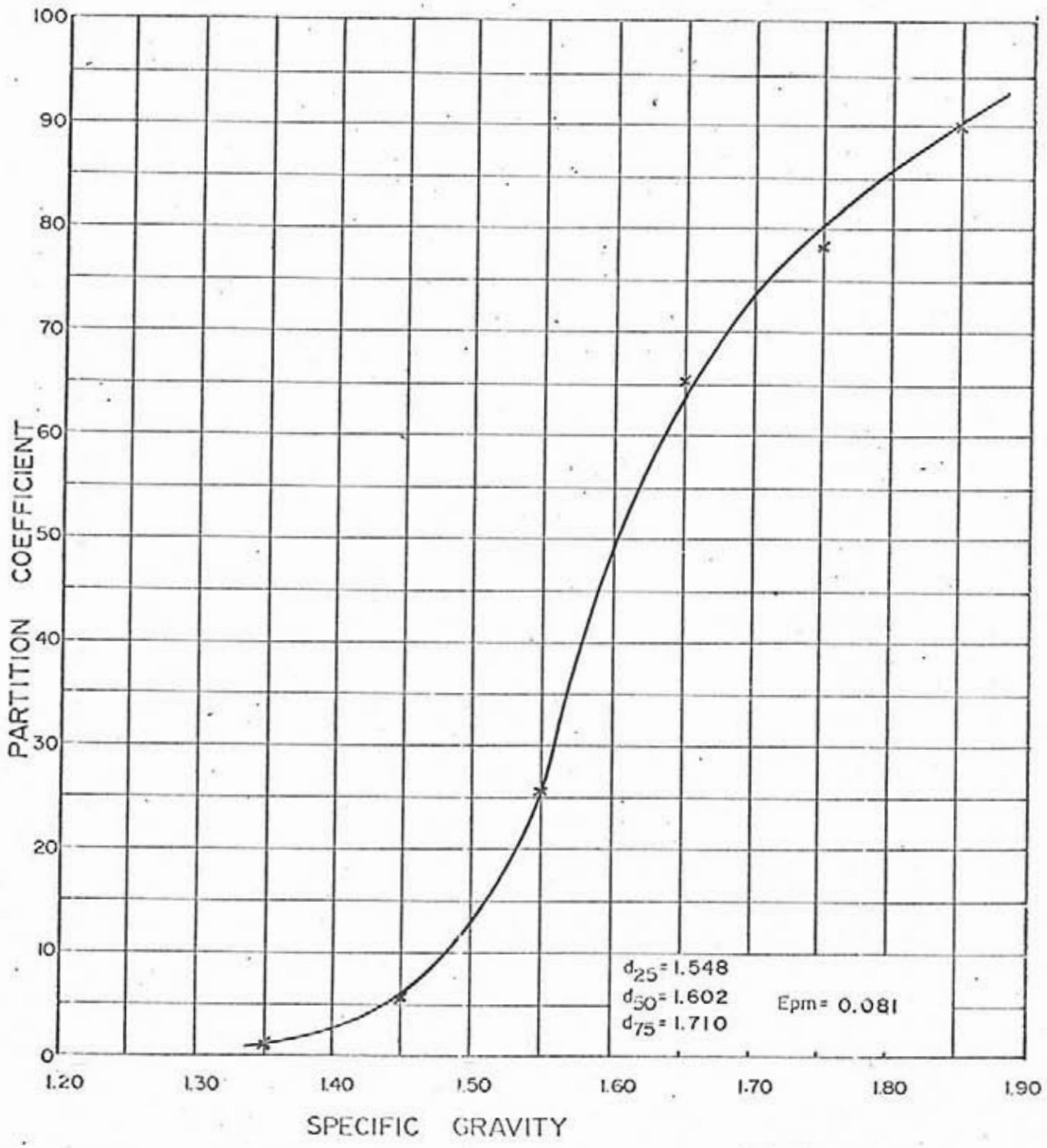
CLIENT: FORDING COAL LIMITED

SAMPLE: *DSM Cyclone Products*- SEAM 4 UPPER

LAB NO. 4093

DATE: Dec. 1982

PARTITION CURVE



Birtley Coal
& Minerals Testing

A DIVISION OF GREAT WESTERN INDUSTRIES LTD

BIRTLEY coal and minerals testing

CLIENT: FORDING COAL LIMITED
PROJECT: ADIT 19, SEAM 4 UPPER BULK SAMPLE
RAW COAL CRUSHED TO -3/4"
LAB NO: 4091
DATE: DECEMBER 22, 1982

HEAD RAW ANALYSIS

ADM%	MOIST%	ASH%	VOL%	F.C.%	S%	CV CAL/GM	HGI	FSI	BASIS
3.70	0.30	23.10	19.70	56.90	0.32	6517	101	4	adb
	3.99	22.25	18.97	54.79	0.31	6276			arb
		23.17	19.76	57.07	0.32	6537			db

APPARENT S.G. ON 3/4" X 0 RAW COAL = 1.52

SIZE AND RAW ANALYSIS, air dried basis

SIZE FRACTION	WT%	ASH%	FSI	CUMULATIVE WT%	CUMULATIVE ASH%
3/4" X 28M	77.00	24.10	4	77.00	24.10
28M X 100M	15.30	17.30	5	92.30	22.97
100M X 0	7.70	15.40	3 1/2	100.00	22.39

FLOAT SINK ANALYSIS, air dried basis: 3/4" X 28M

S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
FLOAT - 1.30	21.20	1.90	9	21.20	5.80
1.30 - 1.35	19.10	4.70	5	40.30	3.23
1.35 - 1.40	22.40	8.60	1 1/2	62.70	5.15
1.40 - 1.45	3.00	13.80	1 1/2	65.70	5.54
1.45 - 1.50	4.60	17.40	1 1/2	70.30	6.32
1.50 - 1.60	4.70	24.40	1	75.00	7.45
1.60 - 1.70	3.70	33.70	1	78.70	8.68
1.70 - 1.80	2.40	39.70	1	81.10	9.60
1.80 - 1.90	1.30	49.80	1	82.40	10.24
1.90 - SINK	17.60	84.30	0	100.00	23.27

CLIENT: FORDING COAL LIMITED
PROJECT: ADIT 19, SEAM 4 UPPER BULK SAMPLE
RAW COAL CRUSHED TO -3/4"
LAB NO: 4091
DATE: DECEMBER 22, 1982

FLOAT SINK ANALYSIS, air dried basis: 28M X 100M

S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
FLOAT - 1.30	12.90	1.60	9	12.90	5.80
1.30 - 1.35	18.40	4.10	8	31.30	3.07
1.35 - 1.40	19.20	6.00	4	50.50	4.18
1.40 - 1.45	15.20	8.60	1	65.70	5.21
1.45 - 1.50	6.30	13.80	1	72.00	5.96
1.50 - 1.60	8.20	21.00	1	80.20	7.50
1.60 - 1.70	5.90	30.30	1	86.10	9.06
1.70 - 1.80	2.90	41.20	1	89.00	10.11
1.80 - 1.90	1.40	47.40	1	90.40	10.68
1.90 - SINK	9.60	75.30	0	100.00	16.89

FROTH FLOTATION TEST: 100M X 0

PRODUCT	WT%	ASH%	FSI	CUMULATIVE WT%	CUMULATIVE ASH%
STAGE 1	87.50	10.00	6	87.50	10.00
STAGE 2	6.10	26.90	1	93.60	11.10
TAILINGS	6.40	66.50	0	100.00	14.65

F.F. PARAMETERS: PULP DENSITY = 10%
REAGENT/DOSAGE = KER:MIBC = 4:1, 0.48LB/T
CONDITIONING TIME = 60 SECONDS
STAGE I & II = FIRST AND SECOND MINUTE FROTHS

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

CLIENT: FORDING COAL LIMITED
PROJECT: ADIT 19, SEAM 4 UPPER BULK SAMPLE
RAW COAL CRUSHED TO - 4"
LAB NO: 4091/4092
DATE: DECEMBER 22, 1982

LAB NO: 4091 - BEFORE ATTRITION

SIZE AND RAW ANALYSIS, air dried basis

SIZE FRACTION	WT%	ASH%	FSI	CUMULATIVE WT%	CUMULATIVE ASH%
4" X 3/8"	46.00	28.30	4	46.00	28.30
3/8" X 28M	40.90	19.80	4	86.90	24.30
28M X 100M	8.80	17.60	4	95.70	23.68
100M X 0	13.1 4.30	15.20	4	100.00	23.32

WT% + 4" = 3.4 - CRUSHED TO PASS 4"

LAB NO: 4092 - AFTER ATTRITION*

SIZE AND RAW ANALYSIS, air dried basis

SIZE FRACTION	WT%	ASH%	FSI	CUMULATIVE WT%	CUMULATIVE ASH%
+ 3/8"	12.40	54.50	1 1/2	12.40	54.50
3/8" X 28M	59.20	18.90	4 1/2	71.60	25.07
28M X 100M	17.70	16.40	5	89.30	23.35
100M X 0	28.2 10.70	15.20	4	100.00	22.48

* ATTRITION TEST BY AUSTRALIAN TUMBLER METHOD - 8 X 50 KG BATCHES EACH TUMBLED @ 20 RPM FOR 7 MINUTES (WITH 18 - 2" STEEL CUBES AND 150 LITERS OF WATER)

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WESTERN STEEL INDUSTRIES LTD

CLIENT: FORDING COAL LIMITED
PROJECT: ADIT 19, SEAM 4 UPPER BULK SAMPLE
RAW COAL CRUSHED TO - 4"
LAB NO: 4092 - AFTER ATTRITION
DATE: DECEMBER 22, 1982

FLOAT SINK ANALYSIS, air dried basis: + 3/8"

S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
FLOAT - 1.30	9.50	1.50	9	9.50	5.80
1.30 - 1.35	16.80	4.30	3	26.30	3.29
1.35 - 1.40	6.10	7.40	2	32.40	4.06
1.40 - 1.45	4.20	11.00	1 1/2	36.60	4.86
1.45 - 1.50	2.30	15.60	1 1/2	38.90	5.49
1.50 - 1.60	2.80	24.50	1 1/2	41.70	6.77
1.60 - 1.70	1.50	38.30	1 1/2	43.20	7.86
1.70 - 1.80	0.60	47.60	1 1/2	43.80	8.41
1.80 - 1.90	0.50	52.60	1	44.30	8.91
1.90 - SINK	55.70	90.70	0	100.00	54.47

FLOAT SINK ANALYSIS, air dried basis: 3/8" X 28M

S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
FLOAT - 1.30	25.80	2.00	9	25.80	5.80
1.30 - 1.35	29.40	5.30	2 1/2	55.20	3.76
1.35 - 1.40	6.70	9.10	1 1/2	61.90	4.34
1.40 - 1.45	9.20	12.10	1	71.10	5.34
1.45 - 1.50	4.40	18.00	1	75.50	6.08
1.50 - 1.60	6.80	25.80	1	82.30	7.71
1.60 - 1.70	2.80	35.80	1	85.10	8.63
1.70 - 1.80	2.00	44.90	1	87.10	9.46
1.80 - 1.90	1.10	52.90	1	88.20	10.01
1.90 - SINK	11.80	81.90	0	100.00	18.49

CLIENT: FORDING COAL LIMITED
PROJECT: ADIT 19, SEAM 4 UPPER BULK SAMPLE
RAW COAL CRUSHED TO - 4"
LAB NO: 4092 - AFTER ATTRITION
DATE: DECEMBER 22, 1982

FLOAT SINK ANALYSIS, air dried basis: 28M X 100M

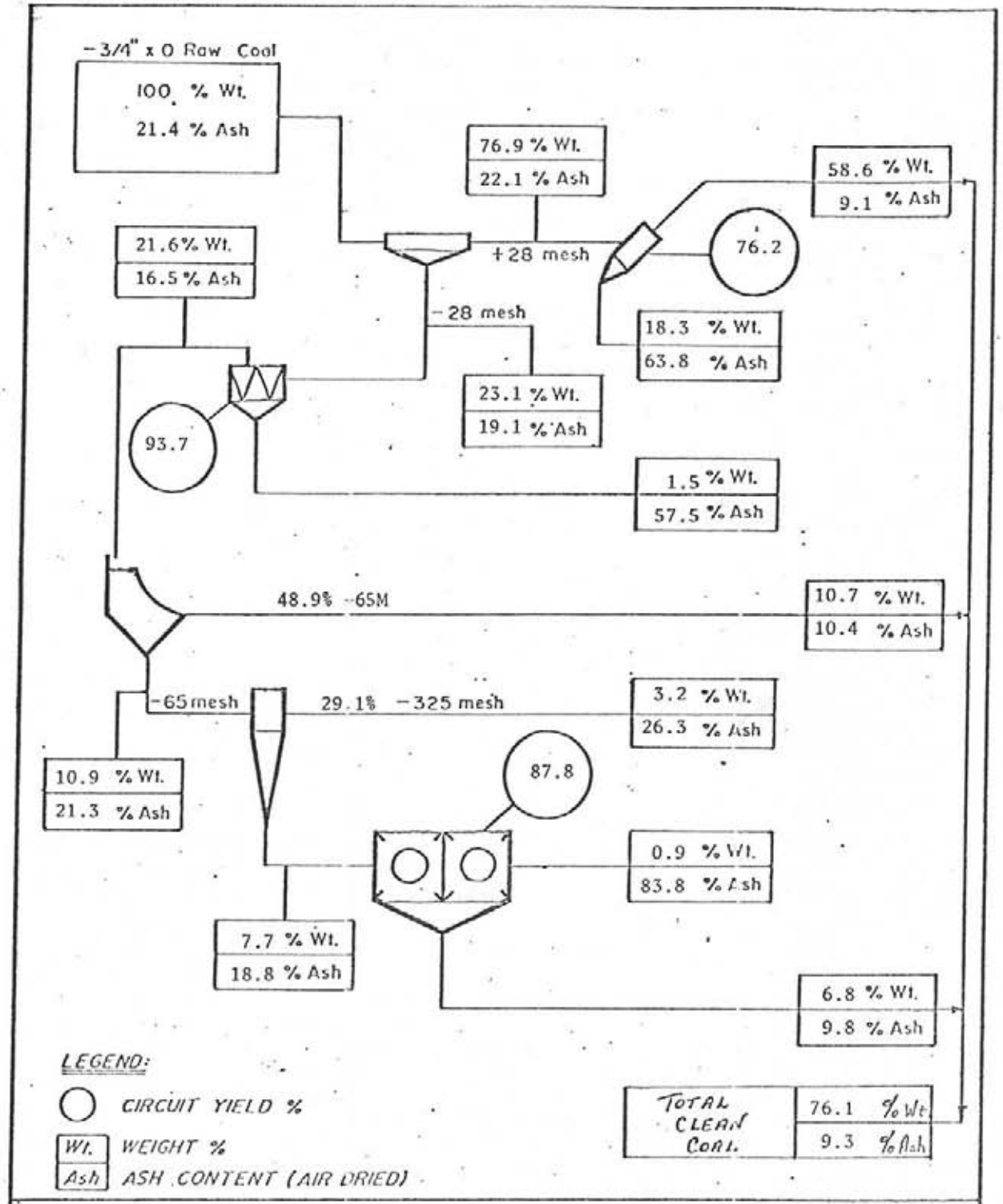
S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
FLOAT - 1.30	16.90	1.50	9	16.90	5.80
1.30 - 1.35	16.50	3.80	8	33.40	2.64
1.35 - 1.40	15.20	5.60	3	48.60	3.56
1.40 - 1.45	16.00	8.20	1 1/2	64.60	4.71
1.45 - 1.50	7.90	12.80	1 1/2	72.50	5.59
1.50 - 1.60	9.80	21.10	1	82.30	7.44
1.60 - 1.70	4.90	30.90	1	87.20	8.76
1.70 - 1.80	2.80	40.30	1	90.00	9.74
1.80 - 1.90	1.40	47.10	1	91.40	10.31
1.90 - SINK	8.60	72.70	0	100.00	15.68

FROTH FLOTATION TEST: 100M X 0

PRODUCT	WT%	ASH%	FSI	CUMULATIVE WT%	CUMULATIVE ASH%
STAGE 1	89.50	10.60	4 1/2	89.50	10.60
STAGE 2	4.50	30.80	1	94.00	11.57
TAILINGS	6.00	69.50	0	100.00	15.04

F.F. PARAMETERS: PULP DENSITY = 10%
REAGENT/DOSAGE = KER:MIBC = 4:1, 0.48LB/T
CONDITIONING TIME = 60 SECONDS
STAGE I & II = FIRST AND SECOND MINUTE FROTHS

Birtley Coal
& Minerals Testing
A DIVISION OF GREATER ENERGY INDUSTRIES LTD



BIRTLEY COAL & MINERALS TESTING

Title PLANT BALANCE FLOW SHEET Fording Coal Limited Adit 19, Seam 4 Lower Bulk Sample Lab No. 4096	Date December, 1982 Drawn

SUMMARY - BULK WASHING DATA *

Bulk Sample Seam 4 Lower Lab.No. 4096

Date Received December 6, 1982 Date Washed December 10, 1982

a) RAW COAL

Delivered Weight 4.417 MT Washed Weight 3.405 MT

ADM% 3.2 ASH% 21.4 FSI 3½

b) HEAVY MEDIA CIRCUIT: 3/4" x 28 Mesh = 76.9 % by weight

S.G. of Medium 1.39 Calculated Yield = 76.2 %

SAMPLE	ASH%	F.S.I.
FEED	22.1	3½
CLEAN COAL	9.1	5
REJECT	63.8	½

c) WATER-ONLY CYCLONE CIRCUIT: 28M x 0 = 23.1 % by weight

V.F.C. #1 = 4 cm #2 = 5 cm Calculated Yield = 93.7 %

SAMPLE	ASH%	F.S.I.
FEED	19.1	5
OVERFLOW	16.5	5½
UNDERFLOW	57.5	1
S.B.O.	10.4	7½
S.B.U.	21.3	4

d) FROTH FLOTATION CIRCUIT: 65M x 0 = 10.9 % by weight

3:1 = Kerosene: M.I.B.C. Calculated Yield = 87.8 %

SAMPLE	ASH%	F.S.I.
T.C.O.	26.3	1
FEED (T.C.U.)	18.8	5
CONCENTRATE	9.8	7
TAILINGS	83.8	0

e) FILTER CAKE: S.B.O. + CONCENTRATE = 10.2 ASH% 7 FSI

* All weights and analysis are on an Air Dried Basis unless otherwise indicated.

Birtley Coal
& Minerals Testing

SUMMARY - BULK WASHING DATA (Cont.)

Bulk Sample Seam 4 Lower Lab.No. 4096

f) CLEAN COAL: H.M.C.C. + FILTER CAKE Calculated Yield 76.1 %

ADM	PROXIMATE				S%	CAL/GM	FSI	HGI	S.G.*
	RM%	ASH%	VM%	FC%					
7.3	0.3	9.2	21.1	69.4	0.36	7818	6	101	1.38

DILATATION TEST				
ST(°C)	MDT(°C)	MC%	MD%	G
407	482	22	-15	0.692

GIESELER FLUIDITY TEST		
	DDPM	TEMP(°C)
START	1	455
MAXIMUM	5	483
FINAL	0	512
	RANGE	57

* S.G. - Apparent S.G. run on 3/4" x 0 coal

Birtley Coal
& Minerals Testing

SUMMARY - BULK WASHING DATA (Cont.)

Bulk Sample Seam 4 Lower Lab.No. 4096

CLEAN COAL INVENTORY

DATE	SHIPPED		IN STOCK	
	BBLS	M.T.	BBLS	M.T.
December 6, 1982	--	--	16	2.462

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD.

SUMMARY - BULK WASHING DATA (Cont.)

Bulk Sample Seam 4 Lower Lab.No. 4096

HEAVY MEDIUM CIRCUIT

CYCLONE: 14" DSM operating @ 52 KPa

MAGNETITE MEDIUM maintained @ 1.39 S.G.

1.	FEED (3/4" x 28 Mesh)	2.617	M.T.	22.1	ASH%	3½	FSI
2.	CLEAN COAL	1.990	M.T.	9.1	ASH%	6	FSI
3.	REJECT	0.627	M.T.	63.8	ASH%	½	FSI

4. YIELD CLEAN COAL (Weighted) $= \frac{1.990}{2.617} =$ 76.0 %

5. YIELD CLEAN COAL (Calculated) $= \frac{63.8 - 22.1}{63.8 - 9.1} =$ 76.2 %

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

SUMMARY - BULK WASHING DATA (Cont.)

Bulk Sample Seam 4 Lower Lab.No. 4096

WATER - ONLY CYCLONE CIRCUIT

Primary Cyclone: 6" DSM operating @ 138 KPa

Vortex Finder Clearance set @ 4 cm

Secondary Cyclone: 4" DSM operating @ 35 KPa

Vortex Finder Clearance set @ 5 cm

Sieve Bend: 65 Mesh

1.	Feed (28 Mesh x 0)	19.1	ASH%	5	F.S.I.
2.	Primary Cyclone Overflow	16.5	ASH%	5½	F.S.I.
3.	Secondary Cyclone Underflow	57.5	ASH%	1	F.S.I.
4.	Sieve Bend Overflow (S.B.O.)	10.4	ASH%	7½	F.S.I.
5.	Sieve Bend Underflow (S.B.U.)	21.3	ASH%	4	F.S.I.

6. Yield (W.O. Cyclone) $= \frac{57.5 - 19.1}{57.5 - 16.5} =$ 93.7 %

7. Wt% 28M x 65M in Primary Cyclone Overflow = 48.9 %

8. Estimated Yield of 28M x 65M (S.B.O., as % of 28M x 0 Feed) = 45.8 %

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

SUMMARY - BULK WASHING DATA (Cont.)

Bulk Sample Seam 4 Lower Lab.No. 4096

FROTH FLOTATION CIRCUIT

Flotation Cell: two (2) Birtley-Humboldt Multi-Wobble impellers in series.

Reagent: 3:1 = Kerosene: M.I.B.C., 21 cc/minute

Thickening Cyclone: 20° - 8" cyclone Hayl-Patterson

1.	Thickening Cyclone Overflow (T.C.O. -325M)	26.3	ASH%	1	FSI
2.	Flotation Feed (Thickening Cyclone Underflow)	18.8	ASH%	5	FSI
3.	Concentrate	9.8	ASH%	7	FSI
4.	Tailings	83.8	ASH%	0	FSI

5. Yield Concentrate = $\frac{83.8 - 18.8}{83.8 - 9.8}$ = 87.8 %

Birtley Coal
& Minerals Testing

CLIENT: FORDING COAL LIMITED
PROJECT: ADIT 19, SEAM 4 LOWER BULK SAMPLE
LAB NO: 4096
DATE: DECEMBER 22, 1982

I. WASHABILITY DATA - HEAVY MEDIUM CYCLONE PRODUCTS for E.P.M.

S.G. FRACTION	PERCENT WEIGHT CLEAN COAL	PERCENT WEIGHT REJECT	PERCENT OF FEED CLEAN COAL	PERCENT OF FEED REJECT	CALCULATED FEED	MEAN S.G.	PARTITION COEFFICIENT
- 1.30	29.30	0.20	22.30	—	22.30	—	—
1.30 - 1.40	55.00	2.10	41.90	0.50	42.40	1.35	1.20
1.40 - 1.50	11.70	6.10	8.90	1.50	10.40	1.45	14.40
1.50 - 1.60	3.00	8.80	2.30	2.10	4.40	1.55	47.70
1.60 - 1.70	0.50	5.20	0.40	1.20	1.60	1.65	75.00
1.70 - 1.80	0.10	4.70	0.10	1.10	1.20	1.75	91.70
1.80 - 1.90	0.10	3.70	0.10	0.90	1.00	1.85	90.00
1.90 - 2.00	0.10	2.90	0.10	0.70	0.80	1.95	87.50
+ 2.00	0.20	66.30	0.10	15.80	15.90	—	99.40

II. WASHABILITY DATA - WATER-ONLY CYCLONE PRODUCTS for E.P.M.

S.G. FRACTION	PERCENT WEIGHT OVERFLOW	PERCENT WEIGHT UNDERFLOW	PERCENT OF FEED OVERFLOW	PERCENT OF FEED UNDERFLOW	CALCULATED FEED	MEAN S.G.	PARTITION COEFFICIENT
- 1.30	24.40	1.10	22.80	0.10	22.90	—	0.40
1.30 - 1.40	42.70	3.20	40.00	0.20	40.20	1.35	0.50
1.40 - 1.50	22.80	5.50	21.40	0.30	21.70	1.45	1.40
1.50 - 1.60	5.20	10.80	4.90	0.70	5.60	1.55	12.50
1.60 - 1.70	2.90	9.80	2.70	0.60	3.30	1.65	18.20
1.70 - 1.80	0.70	6.80	0.60	0.40	1.00	1.75	40.00
1.80 - 1.90	0.50	8.70	0.50	0.60	1.10	1.85	54.50
1.90 - 2.00	0.20	13.40	0.20	0.80	1.00	1.95	80.00
+ 2.00	0.60	40.70	0.60	2.60	3.20	—	81.30

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD.

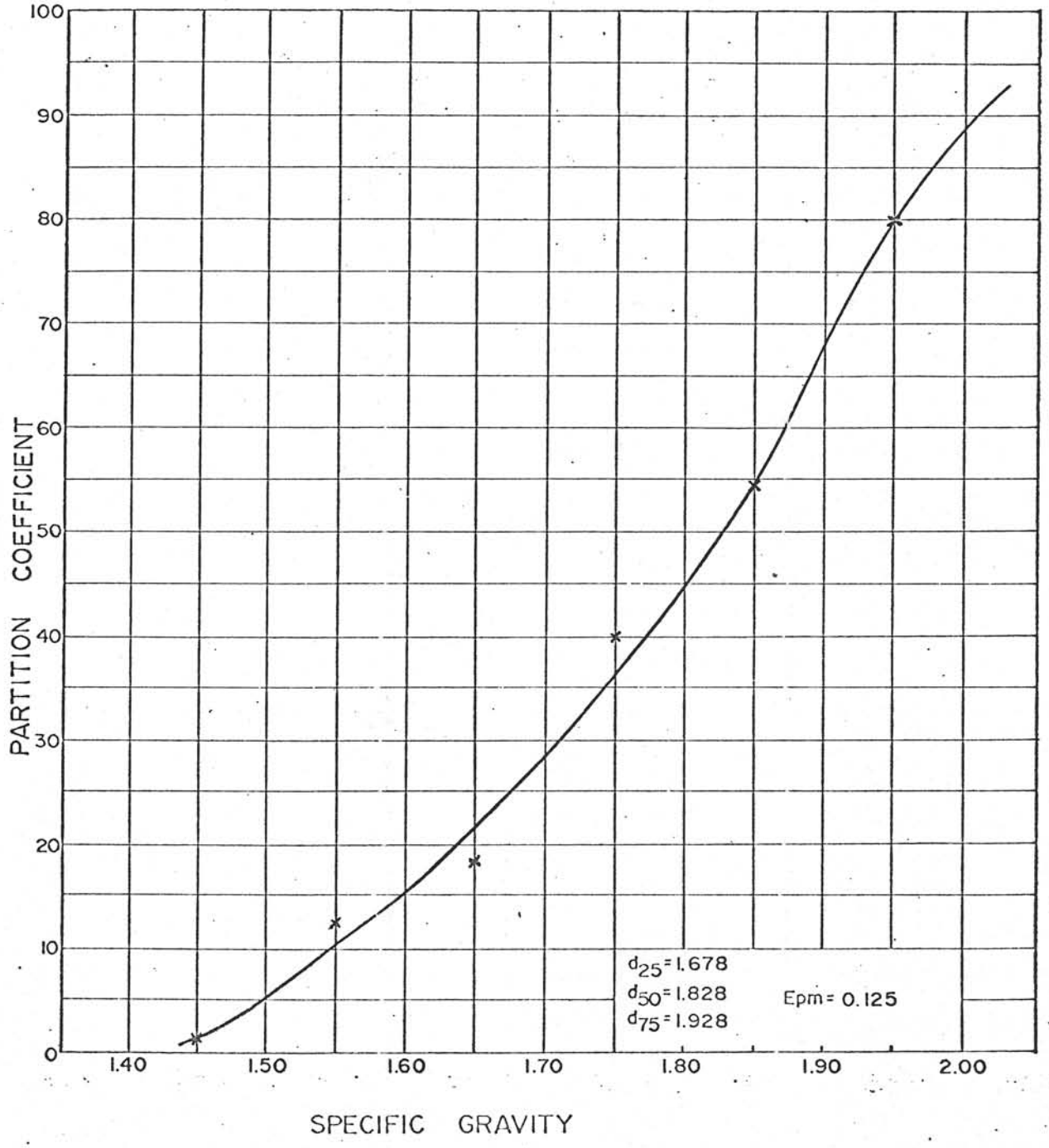
CLIENT: FORDING COAL LIMITED

SAMPLE: *W.O. Cyclone Products* - SEAM 4 LOWER

LAB NO. 4096

DATE: Dec. 1982

PARTITION CURVE



Birtley Coal
& Minerals Testing

A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD.

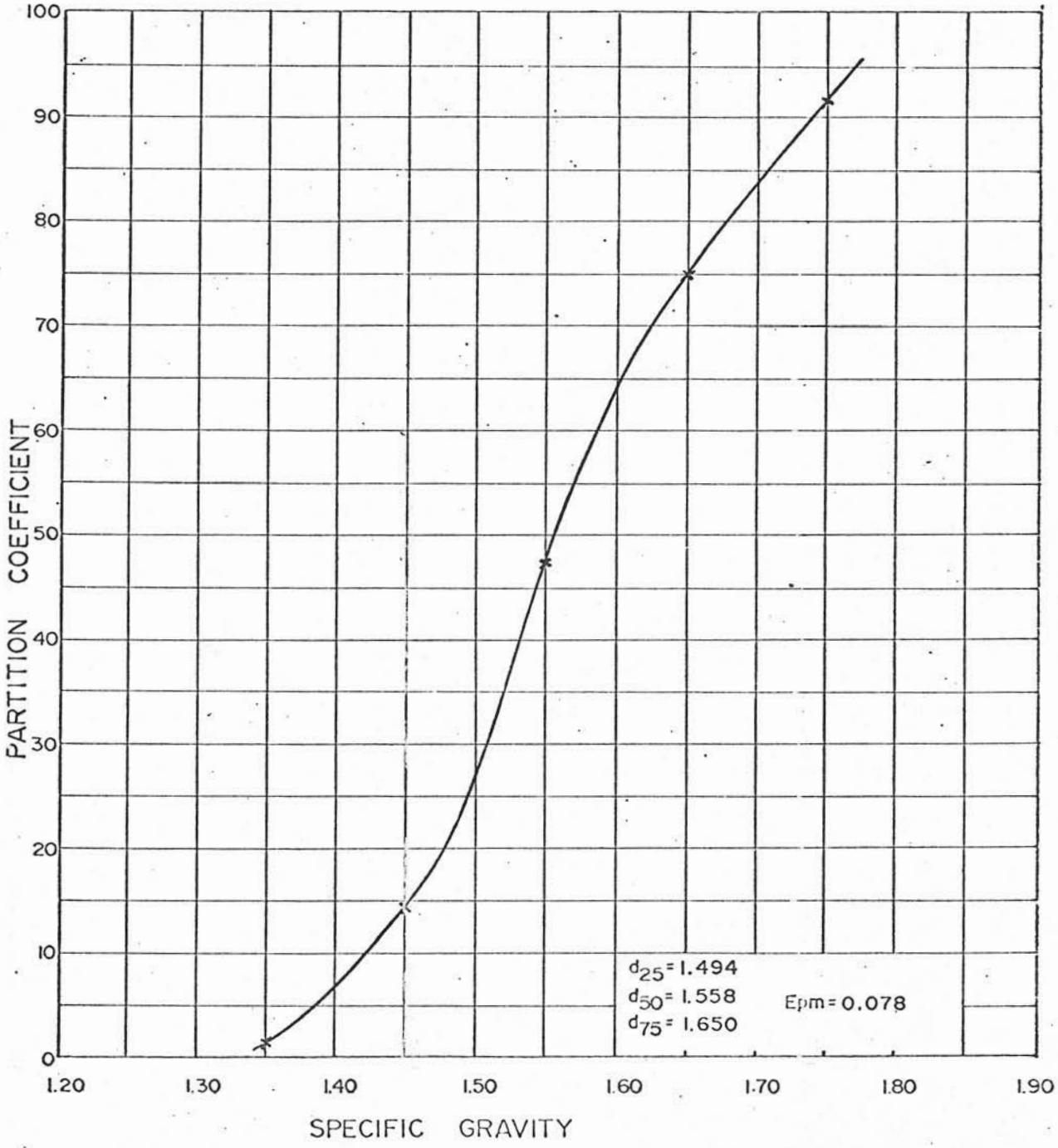
CLIENT: FORDING COAL LIMITED

SAMPLE: *DSM Cyclone Products*- SEAM 4 LOWER

LAB NO. 4096

DATE: Dec. 1982

PARTITION CURVE



Birtley Coal
& Minerals Testing

A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

BIRTLEY coal and minerals testing

CLIENT: FORDING COAL LIMITED
PROJECT: ADIT 19, SEAM 4 LOWER BULK SAMPLE
RAW COAL CRUSHED TO -3/4"
LAB NO: 4094
DATE: DECEMBER 22, 1982

HEAD RAW ANALYSIS

ADM%	MOIST%	ASH%	VOL%	F.C.%	S%	CV CAL/GM	HGI	FSI	BASIS
3.20	0.40	21.40	20.70	57.50	0.30	6580	95	3 1/2	adb
	3.59	20.72	20.04	55.66	0.29	6369			arb
		21.49	20.78	57.73	0.30	6606			db

APPARENT S.G. ON 3/4" X 0 RAW COAL = 1.50

SIZE AND RAW ANALYSIS, air dried basis

	SIZE FRACTION	WT%	ASH%	FSI	CUMULATIVE WT%	CUMULATIVE ASH%
Coarse	3/4" X 28M	81.60	23.20	3 1/2	81.60	23.20
Fine	28M X 100M	12.50	14.40	7 1/2	94.10	22.03
	100M X 0 18.40	5.90	12.10	7 1/2	100.00	21.45

FLOAT SINK ANALYSIS, air dried basis: 3/4" X 28M

S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
FLOAT - 1.30	16.40	2.70	9	16.40	5.80
1.30 - 1.35	23.10	5.80	4	39.50	4.51
1.35 - 1.40	23.80	9.50	1 1/2	63.30	6.39
1.40 - 1.45	5.40	15.40	1 1/2	68.70	7.10
1.45 - 1.50	5.90	19.30	1	74.60	8.06
1.50 - 1.60	3.70	26.90	1	78.30	8.95
1.60 - 1.70	2.20	37.00	1	80.50	9.72
1.70 - 1.80	1.40	43.50	1	81.90	10.30
1.80 - 1.90	1.10	52.60	1	83.00	10.86
1.90 - SINK	17.00	77.90	0	100.00	22.25

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

CLIENT: FORDING COAL LIMITED
PROJECT: ADIT 19, SEAM 4 LOWER BULK SAMPLE
RAW COAL CRUSHED TO -3/4"
LAB NO: 4094
DATE: DECEMBER 22, 1982

FLOAT SINK ANALYSIS, air dried basis: 28M x 100M

S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
FLOAT - 1.30	15.90	2.60	9	15.90	5.80
1.30 - 1.35	29.20	4.10	8 1/2	45.10	3.57
1.35 - 1.40	18.60	7.40	3 1/2	63.70	4.69
1.40 - 1.45	12.50	10.00	1	76.20	5.56
1.45 - 1.50	5.60	15.00	1	81.80	6.21
1.50 - 1.60	5.20	22.80	1	87.00	7.20
1.60 - 1.70	2.50	30.60	1	89.50	7.85
1.70 - 1.80	1.70	39.70	1	91.20	8.45
1.80 - 1.90	0.80	47.70	1	92.00	8.79
1.90 - SINK	8.00	72.20	0	100.00	13.86

FROTH FLOTATION TEST: 100M X 0

PRODUCT	WT%	ASH%	FSI	CUMULATIVE WT%	CUMULATIVE ASH%
STAGE 1	91.60	9.10	7	91.60	9.10
STAGE 2	4.50	24.20	1 1/2	96.10	9.81
TAILINGS	3.90	68.60	0	100.00	12.10

F.F. PARAMETERS: PULP DENSITY = 10%
REAGENT/DOSAGE = KER:MIBC = 4:1, 0.48LB/T
CONDITIONING TIME = 60 SECONDS
STAGE I & II = FIRST AND SECOND MINUTE FROTHS

Birtley Coal
& Minerals Testing

CLIENT: FORDING COAL LIMITED
PROJECT: ADIT 19, SEAM 4 LOWER BULK SAMPLE
RAW COAL CRUSHED TO -4"
LAB NO: 4094/4095
DATE: DECEMBER 22, 1982

LAB NO: 4094 - BEFORE ATTRITION

SIZE AND RAW ANALYSIS, air dried basis

SIZE FRACTION	WT%	ASH%	FSI	CUMULATIVE WT%	CUMULATIVE ASH%
4" X 3/8"	44.60	26.90	3	44.60	26.90
3/8" X 28M	42.50	16.60	4 1/2	87.10	21.87
28M X 100M	8.60	13.60	7 1/2	95.70	21.13
100M X 0	4.30	12.00	7 1/2	100.00	20.74

WT% + 4" = 4.8 - CRUSHED TO PASS 4"

LAB NO: 4095 - AFTER ATTRITION*

SIZE AND RAW ANALYSIS, air dried basis

SIZE FRACTION	WT%	ASH%	FSI	CUMULATIVE WT%	CUMULATIVE ASH%
+ 3/8"	13.90	47.90	1 1/2	13.90	47.90
3/8" X 28M	60.00	17.70	4 1/2	73.90	23.38
28M X 100M	16.70	13.40	6 1/2	90.60	21.54
100M X 0	9.40	12.20	5	100.00	20.66

* ATTRITION TET BY AUSTRALIAN TUMBLER METHOD - 8 X 50 KG BATCHES EACH TUMBLED @ 20 RPM FOR 7 MINUTES (WITH 18 - 2 INCH STEEL CUBES AND 150 LITERS OF WATER)

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

CLIENT: FORDING COAL LIMITED
PROJECT: ADIT 19, SEAM 4 LOWER BULK SAMPLE
RAW COAL CRUSHED TO -4"
LAB NO: 4095
DATE: DECEMBER 22, 1982

FLOAT SINK ANALYSIS, air dried basis: +3/8"

S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
FLOAT - 1.30	0.60	1.60	9	0.60	5.80
1.30 - 1.35	18.30	4.80	5 1/2	18.90	4.70
1.35 - 1.40	1.90	6.20	5	20.80	4.84
1.40 - 1.45	10.60	9.50	1 1/2	31.40	6.41
1.45 - 1.50	6.50	13.60	1 1/2	37.90	7.64
1.50 - 1.60	3.40	19.60	1 1/2	41.30	8.63
1.60 - 1.70	1.10	33.50	1 1/2	42.40	9.27
1.70 - 1.80	1.70	41.00	1 1/2	44.10	10.50
1.80 - 1.90	4.10	53.00	1/2	48.20	14.11
1.90 - SINK	51.80	79.40	0	100.00	47.93

FLOAT SINK ANALYSIS, air dried basis: 3/8" X 28M

S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
FLOAT - 1.30	19.60	2.50	9	19.60	5.80
1.30 - 1.35	40.60	7.10	2	60.20	5.60
1.35 - 1.40	4.20	10.70	1 1/2	64.40	5.93
1.40 - 1.45	10.40	14.10	1 1/2	74.80	7.07
1.45 - 1.50	5.50	19.30	1 1/2	80.30	7.91
1.50 - 1.60	5.50	26.90	1 1/2	85.80	9.13
1.60 - 1.70	2.10	37.80	1	87.90	9.81
1.70 - 1.80	1.40	45.20	1	89.30	10.37
1.80 - 1.90	0.90	50.40	1	90.20	10.76
1.90 - SINK	9.80	78.20	0	100.00	17.37

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WESTERN ELECTRONICS INDUSTRIES LTD

CLIENT: FORDING COAL LIMITED
PROJECT: ADIT 19, SEAM 4 LOWER BULK SAMPLE
RAW COAL CRUSHED TO -4"
LAB NO: 4095 - AFTER ATTRITION
DATE: DECEMBER 22, 1982

FLOAT SINK ANALYSIS, air dried basis: 28M X 100M

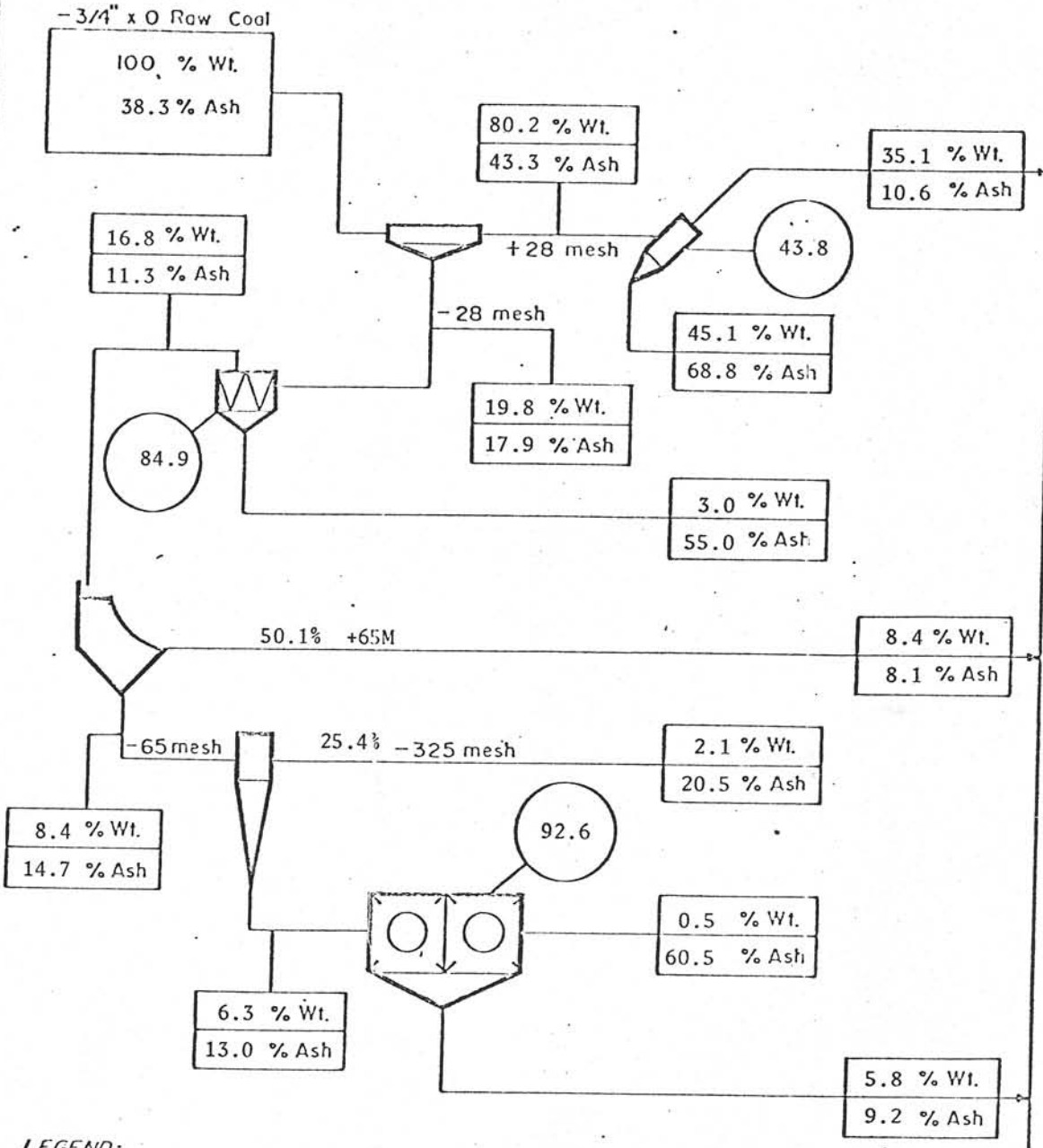
S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
FLOAT - 1.30	17.50	2.00	9	17.50	5.80
1.30 - 1.35	17.00	3.70	8	34.50	2.84
1.35 - 1.40	21.30	6.30	5 1/2	55.80	4.16
1.40 - 1.45	16.70	10.50	2	72.50	5.62
1.45 - 1.50	9.20	14.10	1	81.70	6.57
1.50 - 1.60	6.30	22.80	1	88.00	7.74
1.60 - 1.70	2.60	32.90	1	90.60	8.46
1.70 - 1.80	1.80	39.90	1	92.40	9.07
1.80 - 1.90	1.00	47.00	1	93.40	9.48
1.90 - SINK	6.60	70.90	0	100.00	13.53

FROTH FLOTATION TEST: 100M X 0

PRODUCT	WT%	ASH%	FSI	CUMULATIVE WT%	CUMULATIVE ASH%
STAGE 1	88.20	8.40	7	88.20	8.40
STAGE 2	5.40	19.80	1 1/2	93.60	9.06
TAILINGS	6.40	56.80	0	100.00	12.11

F.F. PARAMETERS: PULP DENSITY = 10%
REAGENT/DOSAGE = KER:MIBC = 4:1, 0.48LB/T
CONDITIONING TIME = 60 SECONDS
STAGE I & II = FIRST AND SECOND MINUTE FROTHS

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WESTERN STEEL INDUSTRIES LTD



BIRTLEY COAL & MINERALS TESTING

Title PLANT BALANCE FLOW SHEET FORDING COAL LIMITED Adit 20, Seam 5 Upper Bulk Sample LAB NO: 4130	Date December, 1982 Drawn

SUMMARY - BULK WASHING DATA *

Bulk Sample Seam 5 Upper Lab.No. 4130

Date Received December 9, 1982 Date Washed December 14, 1982

a) RAW COAL

Delivered Weight 4.445 MT Washed Weight 3.292 MT

ADM% 2.2 ASH% 38.3 FSI 4

b) HEAVY MEDIA CIRCUIT: 3/4" x 28 Mesh = 80.2 % by weight

S.G. of Medium 1.34 Calculated Yield = 43.8 %

SAMPLE	ASH%	F.S.I.
FEED	43.3	2
CLEAN COAL	10.6	8
REJECT	68.8	1

c) WATER-ONLY CYCLONE CIRCUIT: 28M x 0 = 19.8 % by weight

V.F.C. #1 = 4 cm #2 = 5 cm Calculated Yield = 84.9 %

SAMPLE	ASH%	F.S.I.
FEED	19.8	8½
OVERFLOW	11.3	9
UNDERFLOW	55.0	1
S.B.O.	8.1	9
S.B.J.	14.7	8

d) FROTH FLOTATION CIRCUIT: 65M x 0 = 8.4 % by weight

3:1 = Kerosene: M.I.B.C. Calculated Yield = 92.6 %

SAMPLE	ASH%	F.S.I.
T.C.O.	20.5	1
FEED (T.C.U.)	13.0	9
CONCENTRATE	9.2	9
TAILINGS	60.5	0

e) FILTER CAKE: S.B.O. + CONCENTRATE = 8.3 ASH% 9 FSI

* All weights and analysis are on an Air Dried Basis unless otherwise indicated.

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

SUMMARY - BULK WASHING DATA (Cont.)

Bulk Sample Seam 5 Upper Lab.No. 4130

f) CLEAN COAL: H.M.C.C. + FILTER CAKE Calculated Yield 49.3 %

ADM	PROXIMATE				S%	CAL/GM	FSI	HGI	S.G.*
	RM%	ASH%	VM%	FC%					
8.1	0.3	10.0	22.3	67.4	0.52	7771	8½	88	1.38

DILATATION TEST				
ST(°C)	MDT(°C)	MC%	MD%	G
395	476	24	50	1.034

GIESELER FLUIDITY TEST		
	DDPM	TEMP(°C)
START	1	451
MAXIMUM	80	484
FINAL	0	518
	RANGE	67

* S.G. - Apparent S.G. run on 3/4" x 0 coal

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

SUMMARY - BULK WASHING DATA (Cont.)

Bulk Sample Seam 5 Upper Lab.No. 4130

CLEAN COAL INVENTORY

DATE	SHIPPED		IN STOCK	
	BBLS	M.T.	BBLS	M.T.
December 15, 1982	--	--	10	1.549

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

SUMMARY - BULK WASHING DATA (Cont.)

Bulk Sample Seam 5 Upper Lab.No. 4130

HEAVY MEDIUM CIRCUIT

CYCLONE: 14" DSM operating @ 52 KPa

MAGNETITE MEDIUM maintained @ 1.34 S.G.

1.	FEED (3/4" x 28 Mesh)	2.639	M.T.	43.3	ASH%	2	FSI
2.	CLEAN COAL	1.152	M.T.	10.6	ASH%	8	FSI
3.	REJECT	1.487	M.T.	68.8	ASH%	1	FSI

4. YIELD CLEAN COAL (Weighted) $= \frac{1.152}{2.639} =$ 43.7 %

5. YIELD CLEAN COAL (Calculated) $= \frac{68.8 - 43.3}{68.8 - 10.6} =$ 43.8 %

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

SUMMARY - BULK WASHING DATA (Cont.)

Bulk Sample Seam 5 Upper Lab.No. 4130

WATER - ONLY CYCLONE CIRCUIT

Primary Cyclone: 6" DSM operating @ 138 KPa

Vortex Finder Clearance set @ 4 cm

Secondary Cyclone: 4" DSM operating @ 35 KPa

Vortex Finder Clearance set @ 5 cm

Sieve Bend: 65 Mesh

1.	Feed (28 Mesh x 0)	17.9	ASH%	8½	F.S.I.
2.	Primary Cyclone Overflow	11.3	ASH%	9	F.S.I.
3.	Secondary Cyclone Underflow	55.0	ASH%	1	F.S.I.
4.	Sieve Bend Overflow (S.B.O.)	8.1	ASH%	9	F.S.I.
5.	Sieve Bend Underflow (S.B.U.)	14.7	ASH%	8	F.S.I.

6. Yield (W.O. Cyclone) $= \frac{55.0 - 17.9}{55.0 - 11.3} =$ 84.9 %

7. Wt% 28M x 65M in Primary Cyclone Overflow = 50.1 %

8. Estimated Yield of 28M x 65M (S.B.O., as % of 28M x 0 Feed) = 42.5 %

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

SUMMARY - BULK WASHING DATA (Cont.)

Bulk Sample Seam 5 Upper Lab.No. 4130

FROTH FLOTATION CIRCUIT

Flotation Cell: two (2) Birtley-Humboldt Multi-Wobble impellers in series.

Reagent: 3:1 = Kerosene: M.I.B.C., 21 cc/minute

Thickening Cyclone: 20° - 8" cyclone Hayl-Patterson

1.	Thickening Cyclone Overflow (T.C.O. -325M)	20.5	ASH%	1	FSI
2.	Flotation Feed (Thickening Cyclone Underflow)	13.0	ASH%	9	FSI
3.	Concentrate	9.2	ASH%	9	FSI
4.	Tailings	60.5	ASH%	0	FSI

5. Yield Concentrate = $\frac{60.5 - 13.0}{60.5 - 9.2}$ = 92.6 %

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WESTERN ELECTRO INDUSTRIES LTD

CLIENT: FORDING COAL LIMITED
PROJECT: ADIT 20, SEAM 5 UPPER
LAB NO: 4130
DATE: DECEMBER 22, 1982

I. WASHABILITY DATA - HEAVY MEDIUM CYCLONE PRODUCTS for E.P.M.

S.G. FRACTION	PERCENT WEIGHT CLEAN COAL	PERCENT WEIGHT REJECT	PERCENT OF FEED CLEAN COAL	PERCENT OF FEED REJECT	CALCULATED FEED	MEAN S.G.	PARTITION COEFFICIENT
- 1.30	42.50	1.00	18.60	0.50	19.10	—	2.60
1.30 - 1.40	40.20	1.60	17.60	0.90	18.50	1.35	4.90
1.40 - 1.50	13.90	3.90	6.10	2.20	8.30	1.45	26.50
1.50 - 1.60	2.00	7.30	0.90	4.10	5.00	1.55	82.00
1.60 - 1.70	0.40	7.30	0.20	4.10	4.30	1.65	95.30
1.70 - 1.80	0.20	4.60	0.10	2.60	2.70	1.75	96.30
1.80 - 1.90	0.20	4.30	0.10	2.40	2.50	1.85	96.00
1.90 - 2.00	0.10	6.70	—	3.80	3.80	1.95	100.00
+ 2.00	0.50	63.30	0.20	35.60	35.80	—	99.40

II. WASHABILITY DATA - WATER-ONLY CYCLONE PRODUCTS for E.P.M.

S.G. FRACTION	PERCENT WEIGHT OVERFLOW	PERCENT WEIGHT UNDERFLOW	PERCENT OF FEED OVERFLOW	PERCENT OF FEED UNDERFLOW	CALCULATED FEED	MEAN S.G.	PARTITION COEFFICIENT
- 1.30	50.10	1.30	42.60	0.20	42.80	—	0.50
1.30 - 1.40	30.40	6.20	25.80	0.90	26.70	1.35	3.40
1.40 - 1.50	9.90	6.50	8.40	1.00	9.40	1.45	10.60
1.50 - 1.60	3.60	9.50	3.10	1.40	4.50	1.55	31.10
1.60 - 1.70	2.20	8.10	1.90	1.20	3.10	1.65	38.70
1.70 - 1.80	1.10	5.50	0.90	0.80	1.70	1.75	47.10
1.80 - 1.90	0.50	5.00	0.40	0.80	1.20	1.85	66.70
1.90 - 2.00	0.50	7.10	0.40	1.10	1.50	1.95	73.30
+ 2.00	1.60	50.80	1.40	7.70	9.10	—	84.60

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

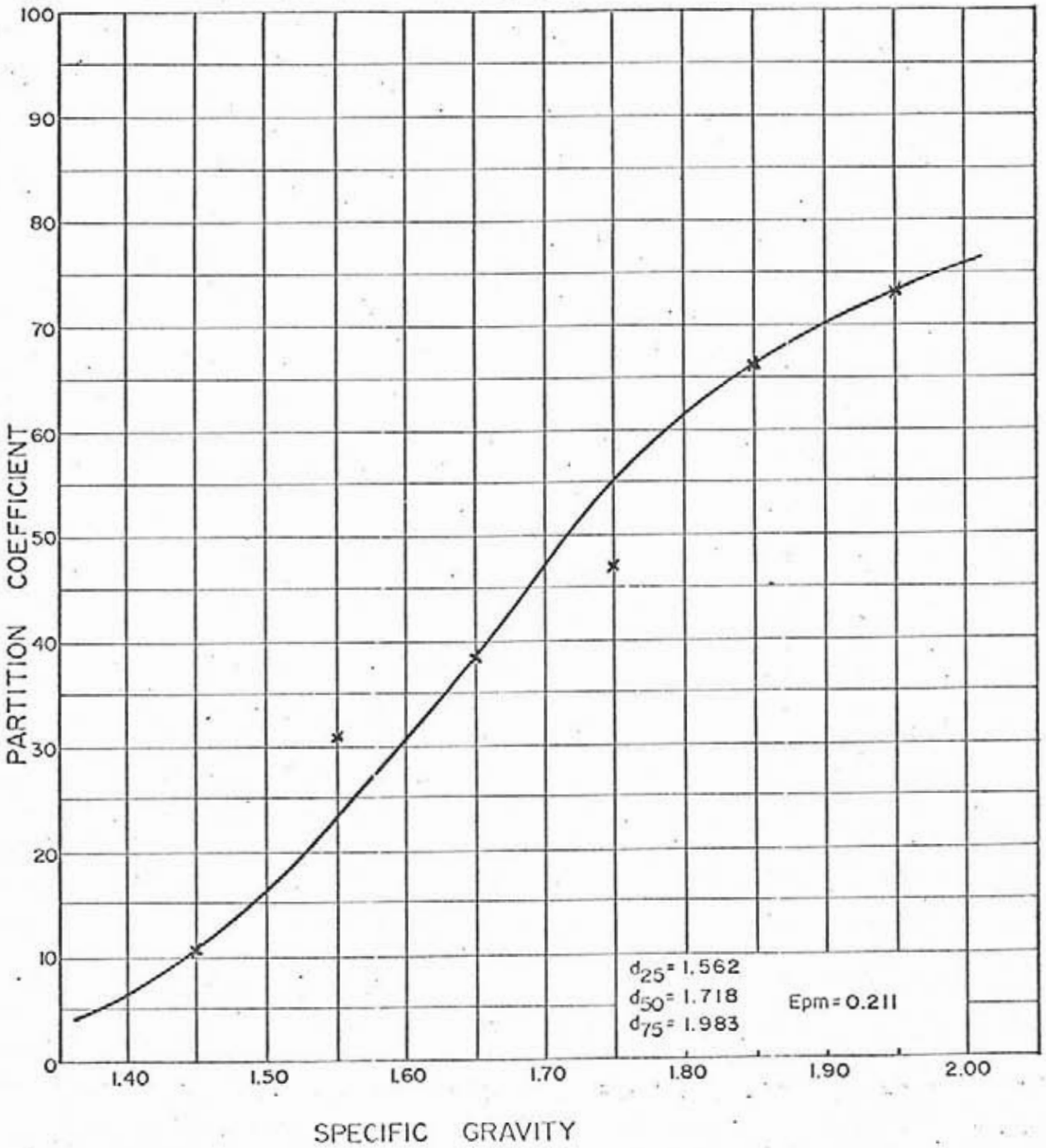
CLIENT: FORDING COAL LIMITED

SAMPLE: *W.O. Cyclone Products* - SEAM 5 UPPER

LAB NO. 4130

DATE: Dec. 1982

PARTITION CURVE



Birtley Coal
& Minerals Testing

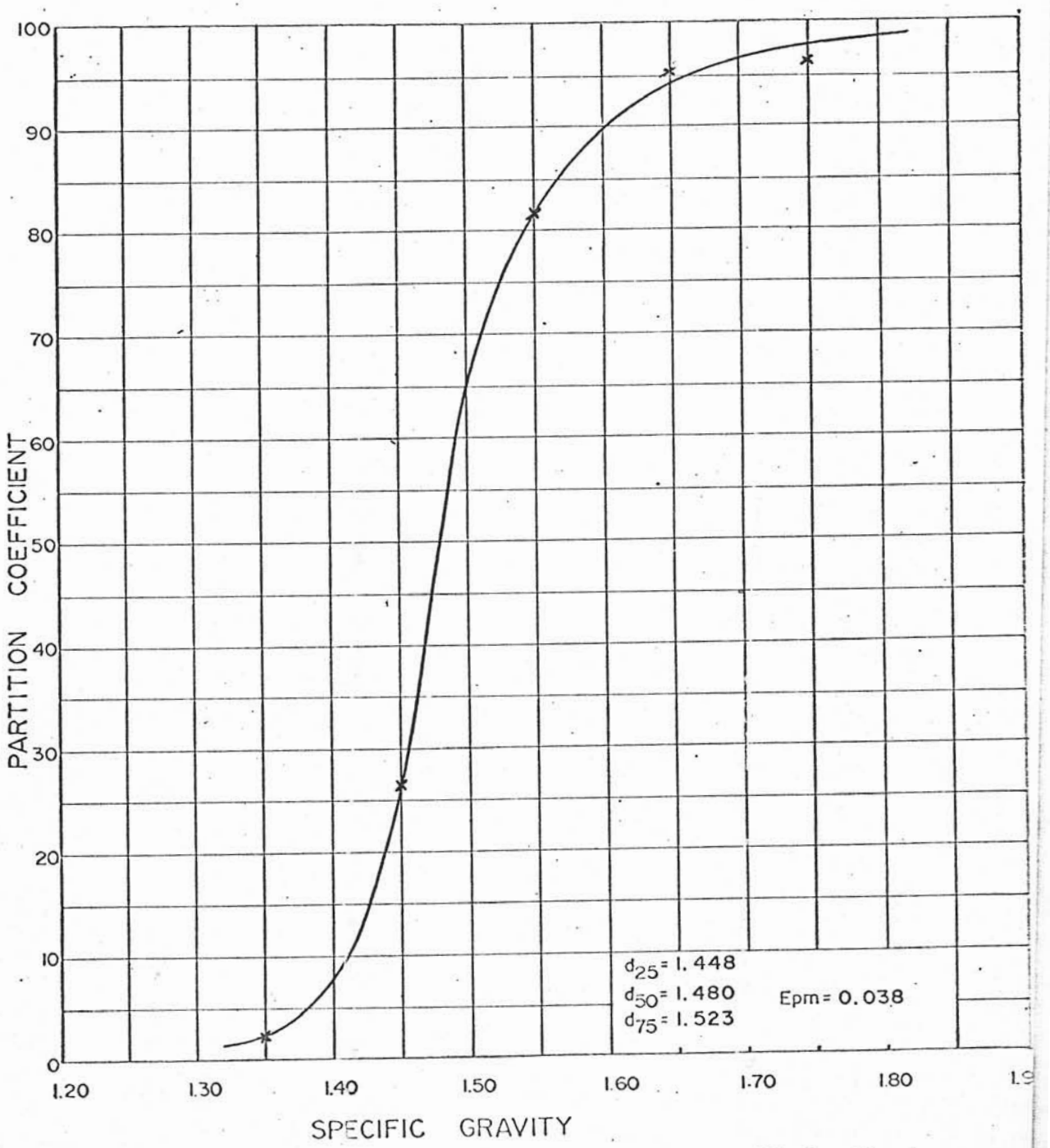
CLIENT: FORDING COAL LIMITED

SAMPLE: *DSM Cyclone Products*- SEAM 5 UPPER

LAB NO. 4130

DATE: Dec. 1982

PARTITION CURVE



Birtley Coal
& Minerals Testing

A DIVISION OF GREAT WESTERN INDUSTRIES LTD

BIRTLEY coal and minerals testing

CLIENT: FORDING COAL LIMITED
PROJECT: ADIT 20, SEAM 5 UPPER BULK SAMPLE
RAW COAL CRUSHED TO -3/4"
LAB NO: 4128
DATE: DECEMBER 22, 1982

HEAD RAW ANALYSIS

ADM%	MOIST%	ASH%	VOL%	F.C.%	S%	CV CAL/GM	HGI	FSI	BASIS
2.20	0.60	38.30	17.10	44.00	0.36	5060	70	4	adb
	2.79	37.46	16.72	43.03	0.35	4949			arb
		38.53	17.20	44.27	0.36	5091			db

APPARENT S.G. ON 3/4" X 0 RAW COAL = 1.70

SIZE AND RAW ANALYSIS, air dried basis

SIZE FRACTION	WT%	ASH%	FSI	CUMULATIVE WT%	CUMULATIVE ASH%
3/4" X 28M	85.80	41.90	2	85.80	41.90
28M X 100M	10.10	17.20	8 1/2	95.90	39.37
100M X 0	4.10	18.20	8 1/2	100.00	38.50

FLOAT-SINK ANALYSIS, air dried basis: 3/4" X 28M

S.G. FRACTION	WT%	ASH%	FSI	CUMULATIVE WT%	CUMULATIVE ASH%
FLOAT - 1.30	14.10	2.70	9	14.10	2.70
1.30 - 1.35	11.30	8.30	4 1/2	25.40	5.19
1.35 - 1.40	10.20	11.10	2 1/2	35.60	6.88
1.40 - 1.45	6.10	17.40	2	41.70	8.42
1.45 - 1.50	5.70	22.00	2	47.40	10.06
1.50 - 1.60	5.50	30.10	1 1/2	52.90	12.14
1.60 - 1.70	4.10	39.40	1	57.00	14.10
1.70 - 1.80	2.70	47.60	1	59.70	15.62
1.80 - 1.90	2.50	54.40	1	62.20	17.17
1.90 - SINK	37.80	82.60	0	100.00	41.91

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

CLIENT: FORDING COAL LIMITED
PROJECT: ADIT 20, SEAM 5 UPPER BULK SAMPLE
RAW COAL CRUSHED TO -3/4"
LAB NO: 4128
DATE: DECEMBER 22, 1982

FLOAT-SINK ANALYSIS, air dried basis: 28M X 100M

S.G. FRACTION	WT%	ASH%	FSI	CUMULATIVE WT%	CUMULATIVE ASH%
FLOAT - 1.30	41.20	1.90	9	41.20	1.90
1.30 - 1.35	11.10	4.20	8 1/2	52.30	2.39
1.35 - 1.40	10.90	7.60	4	63.20	3.29
1.40 - 1.45	8.50	11.80	2 1/2	71.70	4.30
1.45 - 1.50	4.90	17.10	1 1/2	76.60	5.12
1.50 - 1.60	4.30	25.00	1 1/2	80.90	6.17
1.60 - 1.70	2.70	33.40	1	83.60	7.05
1.70 - 1.80	1.90	41.50	1	85.50	7.82
1.80 - 1.90	1.60	49.90	1	87.10	8.59
1.90 - SINK	12.90	78.50	0	100.00	17.61

FROTH FLOTATION TEST: 100M X 0

PRODUCT	WT%	ASH%	FSI	CUMULATIVE WT%	CUMULATIVE ASH%
STAGE 1	80.90	10.30	9	80.90	10.30
STAGE 2	4.60	27.10	4	85.50	11.20
TAILINGS	14.50	55.30	1 1/2	100.00	17.60

F.F. PARAMETERS: PULP DENSITY = 10%
REAGENT/DOSAGE = KER:MIBC = 4:1, 0.48LB/T
CONDITIONING TIME = 60 SECONDS
STAGE I & II = FIRST AND SECOND MINUTE FROTHS

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WESTERN STEEL INDUSTRIES LTD

CLIENT: FORDING COAL LIMITED
PROJECT: ADIT 20, SEAM 5 UPPER BULK SAMPLE
RAW COAL CRUSHED TO -4"
LAB NO: 4128/4129
DATE: DECEMBER 22, 1982

LAB NO: 4128 - BEFORE ATTRITION

SIZE AND RAW ANALYSIS, air dried basis

SIZE FRACTION	WT%	ASH%	FSI	CUMULATIVE WT%	CUMULATIVE ASH%
4" X 3/8"	63.70	45.40	1	63.70	45.40
3/8" X 28M	28.50	29.60	7	92.20	40.52
28M X 100M	5.30	14.70	8 1/2	97.50	39.11
100M X 0	1.5 2.50	14.40	8 1/2	100.00	38.49

WT% + 4" = 5.3 - CRUSHED TO PASS 4"

LAB NO: 4129 - AFTER ATTRITION*

SIZE AND RAW ANALYSIS, air dried basis

SIZE FRACTION	WT%	ASH%	FSI	CUMULATIVE WT%	CUMULATIVE ASH%
+ 3/8"	56.00	48.70	1 1/2	56.00	48.70
3/8" X 28M	31.10	31.00	5 1/2	87.10	42.38
28M X 100M	8.40	14.00	8 1/2	95.50	39.88
100M X 0	12.9 4.50	15.90	7 1/2	100.00	38.80

* ATTRITION TEST BY AUSTRALIAN TUMBLER METHOD - 8 X 50 KG BATCHES EACH TUMBLED @ 20 RPM FOR 2 1/3 MINUTES WITH 18 - 2 INCH STEEL CUBES AND 150 LITERS OF WATER.

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

CLIENT: FORDING COAL LIMITED
PROJECT: ADIT 20, SEAM 5 UPPER BULK SAMPLE
RAW COAL CRUSHED TO -4"
LAB NO: 4129 - AFTER ATTRITION
DATE: DECEMBER 22, 1982

FLOAT SINK ANALYSIS, air dried basis: + 3/8"

S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
FLOAT - 1.30	5.60	5.80	6 1/2	5.60	5.80
1.30 - 1.35	13.60	8.90	3 1/2	19.20	8.00
1.35 - 1.40	8.90	12.60	3 1/2	28.10	9.45
1.40 - 1.45	5.30	17.50	3 1/2	33.40	10.73
1.45 - 1.50	6.60	22.40	3 1/2	40.00	12.66
1.50 - 1.60	4.50	30.40	1 1/2	44.50	14.45
1.60 - 1.70	4.00	40.20	1 1/2	48.50	16.57
1.70 - 1.80	2.00	48.20	1	50.50	17.83
1.80 - 1.90	2.90	55.80	1	53.40	19.89
1.90 - SINK	46.60	82.90	0	100.00	49.25

FLOAT SINK ANALYSIS, air dried basis: 3/8" x 28M

S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
FLOAT - 1.30	24.60	2.40	9	24.60	5.80
1.30 - 1.35	13.50	7.60	7 1/2	38.10	4.24
1.35 - 1.40	9.90	12.40	3	48.00	5.93
1.40 - 1.45	7.90	17.70	3	55.90	7.59
1.45 - 1.50	4.70	23.30	2	60.60	8.81
1.50 - 1.60	4.80	29.00	1 1/2	65.40	10.29
1.60 - 1.70	4.30	38.50	1	69.70	12.03
1.70 - 1.80	3.00	46.30	1	72.70	13.44
1.80 - 1.90	2.30	55.00	1	75.00	14.72
1.90 - SINK	25.00	79.90	0	100.00	31.01

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

CLIENT: FORDING COAL LIMITED
PROJECT: ADIT 20, SEAM 5 UPPER BULK SAMPLE
RAW COAL CRUSHED TO -4"
LAB NO: 4129 - AFTER ATTRITION
DATE: DECEMBER 22, 1982

FLOAT SINK ANALYSIS, air dried basis: 28M X 100M

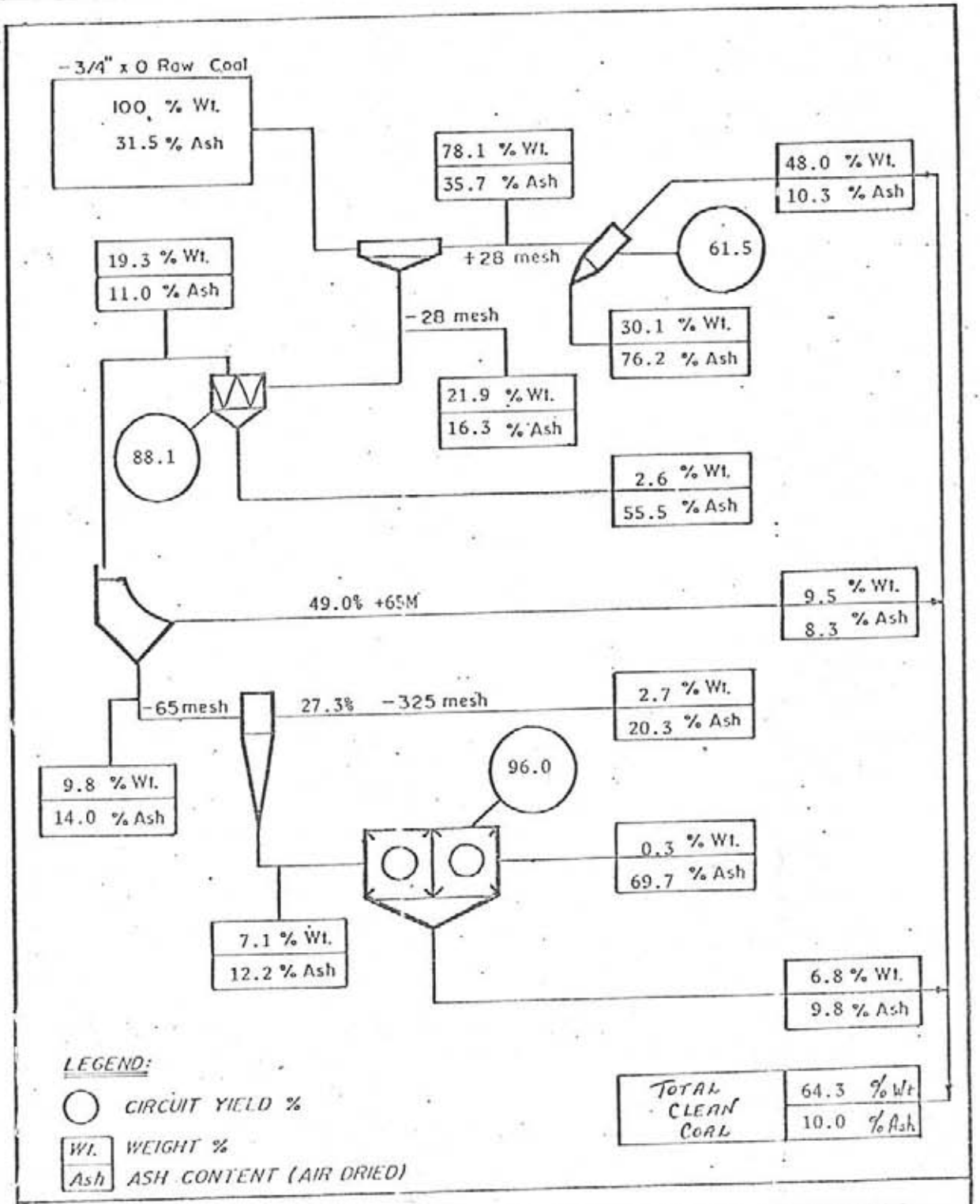
S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
FLOAT - 1.30	45.20	2.20	9	45.20	5.80
1.30 - 1.35	15.10	5.40	9	60.30	3.00
1.35 - 1.40	14.10	7.20	8 1/2	74.40	3.80
1.40 - 1.45	4.70	13.20	5	79.10	4.36
1.45 - 1.50	3.40	19.80	2	82.50	4.99
1.50 - 1.60	3.90	27.80	1 1/2	86.40	6.02
1.60 - 1.70	2.50	35.50	1 1/2	88.90	6.85
1.70 - 1.80	1.80	43.10	1 1/2	90.70	7.57
1.80 - 1.90	0.80	50.30	1	91.50	7.94
1.90 - SINK	8.50	76.10	0	100.00	13.74

FROTH FLOTATION TEST: 100M X 0

PRODUCT	WT%	ASH%	FSI	CUMULATIVE WT%	CUMULATIVE ASH%
STAGE 1	58.90	9.90	8 1/2	58.90	9.90
STAGE 2	7.40	18.00	6	66.30	10.80
TAILINGS	33.70	25.20	5	100.00	15.66

F.F. PARAMETERS: PULP DENSITY = 10%
REAGENT/DOSAGE = KER:MIBC = 4:1, 0.48LB/T
CONDITIONING TIME = 60 SECONDS
STAGE I & II = FIRST AND SECOND MINUTE FROTHS

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD



BIRTLEY COAL & MINERALS TESTING

Title PLANT BALANCE FLOW SHEET FORDING COAL LIMITED Adit 20, Seam 5 Lower Bulk Sample LAB NO: 4133	Date December, 1982 Drawn

SUMMARY - BULK WASHING DATA *

Bulk Sample Seam 5 Lower Lab.No. 4133

Date Received December 9, 1982 Date Washed December 15, 1982

a) RAW COAL

Delivered Weight 4.544 MT Washed Weight 3.466 MT

ADM% 2.7 ASH% 31.5 FSI 3

b) HEAVY MEDIA CIRCUIT: 3/4" x 28 Mesh = 78.1 % by weight

S.G. of Medium 1.38 Calculated Yield = 61.5 %

SAMPLE	ASH%	F.S.I.
FEED	35.7	1½
CLEAN COAL	10.3	3½
REJECT	76.2	½

c) WATER-ONLY CYCLONE CIRCUIT: 28M x 0 = 21.9 % by weight

V.F.C. #1 = 4 cm #2 = 5 cm Calculated Yield = 88.1 %

SAMPLE	ASH%	F.S.I.
FEED	16.3	7
OVERFLOW	11.0	7½
UNDERFLOW	55.5	1½
S.B.O.	8.3	8
S.B.U.	14.0	7

d) FROTH FLOTATION CIRCUIT: 65M x 0 = 9.8 % by weight

3:1 = Kerosene: M.I.B.C. Calculated Yield = 96.0 %

SAMPLE	ASH%	F.S.I.
T.C.O.	20.3	1
FEED (T.C.U.)	12.2	7
CONCENTRATE	9.8	8
TAILINGS	69.7	0

e) FILTER CAKE: S.B.O. + CONCENTRATE = 8.8 ASH% 8 FSI

* All weights and analysis are on an Air Dried Basis unless otherwise indicated.

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD.

SUMMARY - BULK WASHING DATA (Cont.)

Bulk Sample Seam 5 Lower Lab.No. 4133

f) CLEAN COAL: H.M.C.C. + FILTER CAKE Calculated Yield 64.3 %

ADM	PROXIMATE				S%	CAL/GM	FSI	HGI	S.G.*
	RM%	ASH%	VM%	FC%					
7.9	0.2	10.0	20.7	69.1	0.50	7773	5	93	1.38

DILATATION TEST				
ST(°C)	MDT(°C)	MC%	MD%	G
407	--	20% @ 464°	--	--

GIESELER FLUIDITY TEST		
	DDPM	TEMP(°C)
START	1	462
MAXIMUM	9	482
FINAL	0	512
RANGE		50

* S.G. - Apparent S.G. run on 3/4" x 0 coal

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

SUMMARY - BULK WASHING DATA (Cont.)

Bulk Sample Seam 5 Lower Lab.No. 4133

CLEAN COAL INVENTORY

DATE	SHIPPED		IN STOCK	
	BBLS	M.T.	BBLS	M.T.
December 16, 1982	--	--	13½	2.115

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD.

SUMMARY - BULK WASHING DATA (Cont.)

Bulk Sample Seam 5 Lower Lab.No. 4133

HEAVY MEDIUM CIRCUIT

CYCLONE: 14" DSM operating @ 52 KPa

MAGNETITE MEDIUM maintained @ 1.38 S.G.

1.	FEED (3/4" x 28 Mesh)	2.706	M.T.	35.7	ASH%	1½	FSI
2.	CLEAN COAL	1.635	M.T.	10.3	ASH%	3½	FSI
3.	REJECT	1.071	M.T.	76.2	ASH%	1	FSI

4. YIELD CLEAN COAL (Weighted) $= \frac{1.635}{2.706} =$ 60.4 %

5. YIELD CLEAN COAL (Calculated) $= \frac{76.2 - 35.7}{76.2 - 10.3} =$ 61.5 %

Birtley Coal
& Minerals Testing

SUMMARY - BULK WASHING DATA (Cont.)

Bulk Sample Seam 5 Lower Lab.No. 4133

WATER - ONLY CYCLONE CIRCUIT

Primary Cyclone: 6" DSM operating @ 138 KPa

Vortex Finder Clearance set @ 4 cm

Secondary Cyclone: 4" DSM operating @ 35 KPa

Vortex Finder Clearance set @ 5 cm

Sieve Bend: 65 Mesh

1.	Feed (28 Mesh x 0)	16.3	ASH%	7	F.S.I.
2.	Primary Cyclone Overflow	11.0	ASH%	7½	F.S.I.
3.	Secondary Cyclone Underflow	55.5	ASH%	1½	F.S.I.
4.	Sieve Bend Overflow (S.B.O.)	8.3	ASH%	8	F.S.I.
5.	Sieve Bend Underflow (S.B.U.)	14.0	ASH%	7	F.S.I.

6. Yield (W.O. Cyclone) $= \frac{55.5 - 16.3}{55.5 - 11.0} =$ 88.1 %

7. Wt% 28M x 65M in Primary Cyclone Overflow = 49.0 %

8. Estimated Yield of 28M x 65M (S.B.O., as % of 28M x 0 Feed) = 43.2 %

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

SUMMARY - BULK WASHING DATA (Cont.)

Bulk Sample Seam 5 Lower Lab.No. 4133

FROTH FLOTATION CIRCUIT

Flotation Cell: two (2) Birtley-Humboldt Multi-Wobble impellers in series.

Reagent: 3:1 = Kerosene: M.I.B.C., 21 cc/minute

Thickening Cyclone: 20° - 8" cyclone Hayl-Patterson

1.	Thickening Cyclone Overflow (T.C.O. -325M)	20.3	ASH%	1	FSI
2.	Flotation Feed (Thickening Cyclone Underflow)	12.2	ASH%	7	FSI
3.	Concentrate	9.8	ASH%	8	FSI
4.	Tailings	69.7	ASH%	0	FSI

5. Yield Concentrate = $\frac{69.7 - 12.2}{69.7 - 9.8}$ = 96.0 %

Birtley Coal
& Minerals Testing
A DIVISION OF GREATER EST STEEL INDUSTRIES LTD.

CLIENT: FORDING COAL LIMITED
PROJECT: ADIT 20, SEAM 5 LOWER BULK SAMPLE
LAB NO: 4133
DATE: DECEMBER 22, 1982

I. WASHABILITY DATA - HEAVY MEDIUM CYCLONE PRODUCTS for E.P.M.

S.G. FRACTION	PERCENT WEIGHT CLEAN COAL	PERCENT WEIGHT REJECT	PERCENT OF FEED CLEAN COAL	PERCENT OF FEED REJECT	CALCULATED FEED	MEAN S.G.	PARTITION COEFFICIENT
- 1.30	24.00	0.00	14.80	--	14.80	--	--
1.30 - 1.40	53.20	0.20	32.70	0.10	32.80	1.35	0.30
1.40 - 1.50	13.90	0.80	8.50	0.30	8.80	1.45	3.40
1.50 - 1.60	7.40	5.50	4.60	2.10	6.70	1.55	31.30
1.60 - 1.70	0.70	7.30	0.40	2.80	3.20	1.65	87.50
1.70 - 1.80	0.20	3.20	0.10	1.20	1.30	1.75	92.30
1.80 - 1.90	0.10	3.10	0.10	1.20	1.30	1.85	92.30
1.90 - 2.00	0.10	4.10	0.10	1.60	1.70	1.95	94.10
+ 2.00	0.40	75.80	0.20	29.20	29.40	--	99.30

II. WASHABILITY DATA - WATER-ONLY CYCLONE PRODUCTS for E.P.M.

S.G. FRACTION	PERCENT WEIGHT OVERFLOW	PERCENT WEIGHT UNDERFLOW	PERCENT OF FEED OVERFLOW	PERCENT OF FEED UNDERFLOW	CALCULATED FEED	MEAN S.G.	PARTITION COEFFICIENT
- 1.30	38.30	1.30	33.70	0.20	33.90	--	0.60
1.30 - 1.40	38.60	4.00	34.00	0.50	34.50	1.35	1.40
1.40 - 1.50	14.50	10.50	12.80	1.20	14.00	1.45	8.60
1.50 - 1.60	3.60	10.70	3.20	1.30	4.50	1.55	28.90
1.60 - 1.70	2.10	7.80	1.90	0.90	2.80	1.65	32.10
1.70 - 1.80	0.90	5.20	0.80	0.60	1.40	1.75	42.90
1.80 - 1.90	0.60	5.40	0.50	0.60	1.10	1.85	54.50
1.90 - 2.00	0.50	5.50	0.40	0.70	1.10	1.95	63.60
+ 2.00	0.90	49.60	0.80	5.90	6.70	--	88.10

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD.

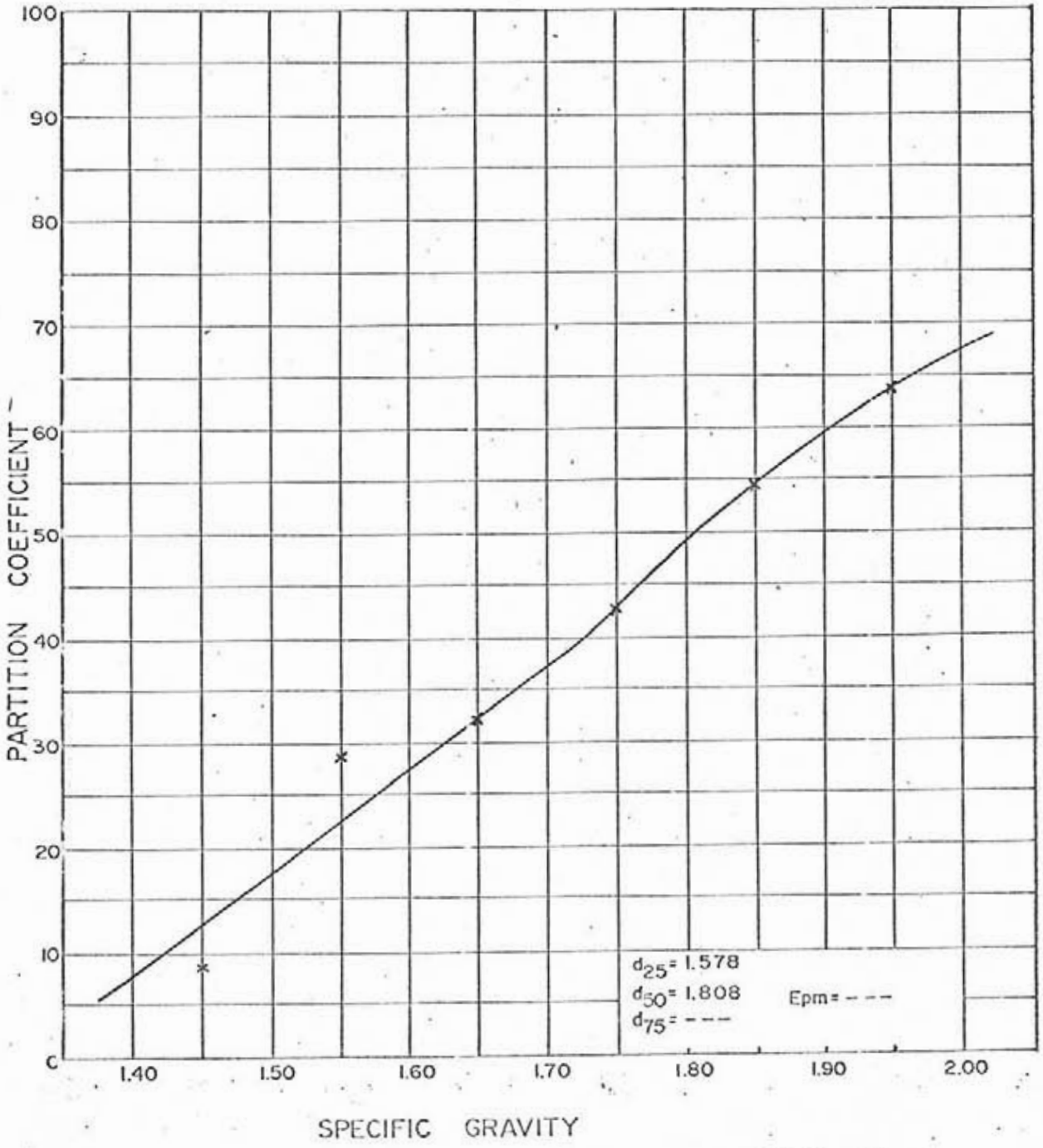
CLIENT: FORDING COAL LIMITED

SAMPLE: *W.O. Cyclone Products* - SEAM 5 LOWER

LAB NO. 4133

DATE: Dec. 1982

PARTITION CURVE



Birtley Coal
& Minerals Testing

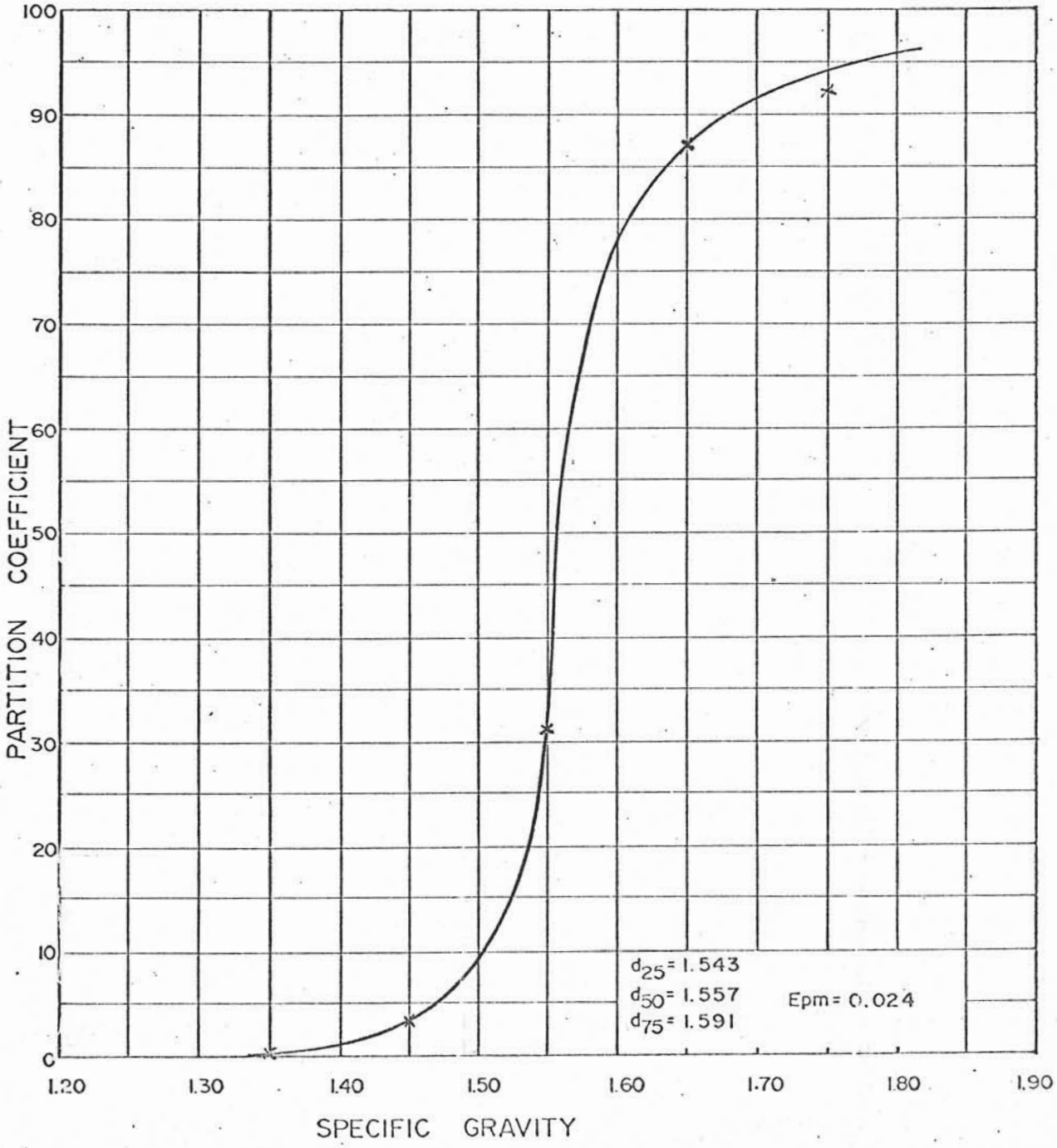
CLIENT: FORDING COAL LIMITED

SAMPLE: DSM *Cyclone Products* - SEAM 5 LOWER

LAB NO. 4133

DATE: Dec. 1982

PARTITION CURVE



Birtley Coal
& Minerals Testing

A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

CLIENT: FORDING COAL LIMITED
PROJECT: ADIT 20, SEAM 5 LOWER BULK SAMPLE
RAW COAL CRUSHED TO -3/4"
LAB NO: 4131
DATE: DECEMBER 22, 1982

HEAD RAW ANALYSIS

ADM%	MOIST%	ASH%	VOL%	F.C.%	S%	CV CAL/GM	HGI	FSI	BASIS
2.70	0.40	31.50	17.40	50.70	0.35	5653	81	3	adb
	3.09	30.65	16.93	49.33	0.34	5500			arb
		31.63	17.47	50.90	0.35	5676			db

APPARENT S.G. ON 3/4" RAW COAL = 1.62

SIZE AND RAW ANALYSIS, air dried basis

SIZE FRACTION	WT%	ASH%	FSI	CUMULATIVE WT%	CUMULATIVE ASH%
3/4" X 28M	80.70	34.80	1 1/2	80.70	34.80
28M X 100M	12.30	17.80	7 1/2	93.00	32.55
100M X 0	7.00	15.40	7	100.00	31.35

FLOAT SINK ANALYSIS, air dried basis: 3/4" X 28M

S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
FLOAT - 1.30	11.70	2.00	9	11.70	5.80
1.30 - 1.35	19.90	5.60	2	31.60	4.27
1.35 - 1.40	10.20	8.50	1 1/2	41.80	5.30
1.40 - 1.45	9.70	12.70	1	51.50	6.69
1.45 - 1.50	6.00	19.80	1	57.50	8.06
1.50 - 1.60	6.20	26.70	1	63.70	9.88
1.60 - 1.70	4.20	36.30	1	67.90	11.51
1.70 - 1.80	1.40	45.10	1	69.30	12.19
1.80 - 1.90	1.30	50.90	1	70.60	12.90
1.90 - SINK	29.40	84.00	1	100.00	33.80

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

CLIENT: FORDING COAL LIMITED
PROJECT: ADIT 20, SEAM 5 LOWER BULK SAMPLE
RAW COAL CRUSHED TO -3/4"
LAB NO: 4131
DATE: DECEMBER 22, 1982

FLOAT SINK ANALYSIS, air dried basis: 28M X 100M

S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
FLOAT - 1.30	30.20	1.20	9	30.20	5.80
1.30 - 1.35	17.00	4.00	7 1/2	47.20	2.21
1.35 - 1.40	16.50	6.70	2	63.70	3.37
1.40 - 1.45	6.20	10.00	1 1/2	69.90	3.96
1.45 - 1.50	6.00	13.70	1	75.90	4.73
1.50 - 1.60	6.70	20.40	1	82.60	6.00
1.60 - 1.70	3.10	33.00	1	85.70	6.98
1.70 - 1.80	1.30	41.40	1	87.00	7.49
1.80 - 1.90	1.10	49.60	1	88.10	8.02
1.90 - SINK	11.90	81.80	1	100.00	16.80

FROTH FLOTATION TEST: 100M X 0

PRODUCT	WT%	ASH%	FSI	CUMULATIVE WT%	CUMULATIVE ASH%
STAGE 1	86.00	8.70	8 1/2	86.00	8.70
STAGE 2	4.80	26.30	2	90.80	9.63
TAILINGS	9.20	67.80	0	100.00	14.98

F.F. PARAMETERS: PULP DENSITY = 10%
REAGENT/DOSAGE = KER:MIBC = 4:1, 0.48LB/T
CONDITIONING TIME = 60 SECONDS
STAGE I & II = FIRST AND SECOND MINUTE FROTHS

Birtley Coal
& Minerals Testing
A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

CLIENT: FORDING COAL LIMITED
PROJECT: ADIT 20, SEAM 5 LOWER BULK SAMPLE
RAW COAL CRUSHED TO -4"
LAB NO: 4131/4132
DATE: DECEMBER 22, 1982

LAB NO: 4131 - BEFORE ATTRITION

SIZE AND RAW ANALYSIS, air dried basis

SIZE FRACTION	WT%	ASH%	FSI	CUMULATIVE WT%	CUMULATIVE ASH%
4" X 3/8"	54.50	39.70	1	54.50	39.70
3/8" X 28M	35.10	24.40	4 1/2	89.60	33.71
28M X 100M	7.10	14.20	8	96.70	32.27
100M X 0	3.30	13.20	8	100.00	31.64

WT% + 4" = 7.3 - CRUSHED TO PASS 4"

LAB NO: 4132 - AFTER ATTRITION*

SIZE AND RAW ANALYSIS, air dried basis

SIZE FRACTION	WT%	ASH%	FSI	CUMULATIVE WT%	CUMULATIVE ASH%
+ 3/8"	40.20	49.20	1	40.20	49.20
3/8" X 28M	40.60	22.60	2 1/2	80.80	35.83
28M X 100M	12.00	11.70	7 1/2	92.80	32.71
100M X 0	7.20	13.90	6 1/2	100.00	31.36

* ATTRITION TEST BY AUSTRALIAN TUMBLER METHOD - 8 X 50 KG BATCHES EACH TUMBLED @ 20 RPM FOR 3 3/4 MINUTES (WITH 18 - 2 INCH STEEL CUBES AND 150 LITERS OF WATER)

Birtley Coal
& Minerals Testing

CLIENT: FORDING COAL LIMITED
PROJECT: ADIT 20, SEAM 5 LOWER BULK SAMPLE
RAW COAL CRUSHED TO -4"
LAB NO: 4132 - AFTER ATTRITION
DATE: DECEMBER 22, 1982

FLOAT SINK ANALYSIS, air dried basis: + 3/8"

S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
FLOAT - 1.30	2.70	3.20	9	2.70	5.80
1.30 - 1.35	20.10	5.80	2	22.80	5.49
1.35 - 1.40	13.90	10.70	1 1/2	36.70	7.46
1.40 - 1.45	1.40	16.30	1 1/2	38.10	7.79
1.45 - 1.50	5.10	21.70	1 1/2	43.20	9.43
1.50 - 1.60	3.10	30.10	1 1/2	46.30	10.82
1.60 - 1.70	2.60	37.60	1	48.90	12.24
1.70 - 1.80	0.70	46.90	1	49.60	12.73
1.80 - 1.90	1.30	54.70	1	50.90	13.80
1.90 - SINK	49.10	85.80	0	100.00	49.15

FLOAT SINK ANALYSIS, air dried basis: 3/8" X 28#

S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
FLOAT - 1.30	18.60	2.40	9	18.60	5.80
1.30 - 1.35	20.30	5.60	2	38.90	4.07
1.35 - 1.40	16.70	9.20	1 1/2	55.60	5.61
1.40 - 1.45	10.80	14.70	1 1/2	66.40	7.09
1.45 - 1.50	6.90	21.30	1 1/2	73.30	8.43
1.50 - 1.60	5.10	28.70	1 1/2	78.40	9.75
1.60 - 1.70	4.00	37.00	1	82.40	11.07
1.70 - 1.80	1.40	46.10	1	83.80	11.65
1.80 - 1.90	1.20	54.00	1	85.00	12.25
1.90 - SINK	15.00	81.00	0	100.00	22.56

Birtley Coal
& Minerals Testing

CLIENT: FORDING COAL LIMITED
PROJECT: ADIT 20, SEAM 5 LOWER BULK SAMPLE
RAW COAL CRUSHED TO -4"
LAB NO: 4132 - AFTER ATTRITION
DATE: DECEMBER 22, 1982

FLOAT SINK ANALYSIS, air dried basis: 28M X 100M

S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE WT%	CUMULATIVE ASH%
FLOAT - 1.30	32.50	1.80	9	32.50	5.80
1.30 - 1.35	17.30	3.70	8 1/2	49.80	2.46
1.35 - 1.40	15.80	6.00	6	65.60	3.31
1.40 - 1.45	11.80	9.80	1 1/2	77.40	4.30
1.45 - 1.50	7.10	14.60	1	84.50	5.17
1.50 - 1.60	5.40	23.10	1	89.90	6.24
1.60 - 1.70	2.80	32.80	1	92.70	7.05
1.70 - 1.80	1.40	41.20	1	94.10	7.55
1.80 - 1.90	0.90	52.30	1	95.00	7.98
1.90 - SINK	5.00	75.50	1/2	100.00	11.35

FROTH FLOTATION TEST: 100M X 0

PRODUCT	WT%	ASH%	FSI	CUMULATIVE WT%	CUMULATIVE ASH%
STAGE 1	80.70	8.70	9	80.70	8.70
STAGE 2	6.80	16.20	3 1/2	87.50	9.28
TAILINGS	12.50	44.70	2	100.00	13.71

F.F. PARAMETERS: PULP DENSITY = 10%
REAGENT/DOSAGE = KER:MIBC = 4:1, 0.48LB/T
CONDITIONING TIME = 60 SECONDS
STAGE I & II = FIRST AND SECOND MINUTE FROTHS

Birtley Coal
& Minerals Testing

ii) Coking Tests - Canmet Report

Energy, Mines and Resources Canada
Énergie, Mines et Ressources Canada

CANMET
Canada Centre for Mineral and Energy Technology
Centre canadien de la technologie des minéraux et de l'énergie

MOVABLE-WALL COKE OVEN TESTS AND RELATED ANALYSES OF FOUR COAL ADIT SAMPLES SUBMITTED BY FORDING COAL LIMITED

Project No. 03-3-1/3-13
Job No. 3414R

J. G. Jorgensen and T. A. Lloyd
Combustion and Carbonization Research Laboratory

MAY 1983

ENERGY RESEARCH PROGRAM
ENERGY RESEARCH LABORATORIES
DIVISION REPORT 83-17 (CF)

C O N F I D E N T I A L
Declassification Date:
June 1984

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MOVABLE-WALL COKE OVEN TESTS AND RELATED ANALYSES OF FOUR COAL ADIT SAMPLES SUBMITTED BY FORDING COAL LIMITED

Project 03-3-1/3-13
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by

J. G. Jorgensen* and T. A. Lloyd**

INTRODUCTION

The evaluation of coals for Fording Coal Limited is a continuing divisional project in which periodic investigations are undertaken as requested by the company.

This report includes evaluation data of four adit samples specified in a letter dated December 6, 1982 from K. A. Komenac, P.Eng., Exploratory Geologist, Fording River Operations, Fording Coal Limited.

The coal samples identified as Nos. 4093, 4096, 4130 and 4433 were cleaned at Birtley Coal and Mineral Testing, Calgary. The samples were crushed, blended and carbonized in the CANMET 310 mm width movable-wall coke oven. Representative samples were taken for chemical, physical, thermal rheological and petrographic analyses. The results of the testing program are tabulated in Tables 1 to 6.

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Table 1 - Chemical analyses of component coals

Identification				
Laboratory Number.....	2153-83	2154-83	2208-83	2209-83
Description.....	#4133	#4096	#4093	#4130
Seam Number.....	5 lower	4 lower	4 upper	5 upper
Classification				
Rank (ASTM).....	lvb	lvb	mvb	mvb
International System.....	431	432	432	433
Specific Volatile Index....	198	197	197	196
Carbon (dmmfb).....%	90.2	92.5	90.7	90.3
Proximate Analysis (db)				
Ash.....%	9.8	9.1	9.1	10.3
Volatile Matter.....%	19.8	20.4	20.8	21.8
Fixed Carbon.....%	70.4	70.5	70.1	67.9
Gross Calorific Value (db)				
MJ/kg.....	32.40	32.71	32.74	32.38
Btu/per pound.....	13930	14060	14080	13920
Ultimate Analysis (db)				
Carbon.....%	80.5	83.2	81.6	80.0
Hydrogen.....%	4.1	4.3	4.2	4.2
Sulphur.....%	0.46	0.33	0.35	0.48
Nitrogen.....%	1.3	1.1	1.1	1.2
Ash.....%	9.8	9.1	9.1	10.3
Oxygen (by difference)....%	3.8	2.0	3.6	3.8
Ash Analysis (db)				
SiO_2.....%	58.0	54.4	55.3	
Al_2O_3.....%	33.3	30.4	31.0	
Fe_2O_3.....%	2.3	7.5	6.4	
TiO_2.....%	1.4	1.9	1.8	
P_2O_5.....%	0.8	1.0	0.5	
CaO.....%	1.2	1.6	1.2	
MgO.....%		0.3	0.4	
SO_3.....%	0.4	0.7	0.7	
Na_2O.....%	0.1	0.1	0.2	
K_2O.....%	0.5	0.3	0.4	

Table 2 - Physical tests and fusibility of ash of component coals

Identification					
Laboratory Number.....		2153-83	2154-83	2208-83	2209-83
Description.....		#4133	#4096	#4093	#4130
Coal Pulverization					
Sieve Analysis					
Passing	Retained On				
	6.3 mm %	0.3	0.2	0.1	0.2
6.3 mm	3.35 mm %	15.7	13.1	13.0	11.9
3.35 mm	1.70 mm %	20.3	19.8	18.0	18.8
1.70 mm	850 µm %	18.5	19.6	18.3	20.5
850 µm	.....%	45.2	47.3	50.6	48.6
Total Passing	3.35 mm %	84.0	86.7	86.9	87.9
Grindability					
Hardgrove Index		91	101	111	83
Fusibility of Ash					
Initial Deformation Temp.....°C		1482+	1482+	1482+	
Softening Temp Spherical.....°C		1482+	1482+	1482+	
Softening Temp Hemispherical.°C		1482+	1482+	1482+	
Fluid Temp.....°C		1482+	1482+	1482+	

Table 3 - Thermal rheological properties of component coals

Identification				
Laboratory Number.....	2153-83	2154-83	2208-83	2209-83
Description.....	#4133	#4096	#4093	#4130
Linear Expansion				
Bd. 833 kg/m^3 at 2% moisture....%	-16.7	-14.7	-11.7	-8.8
Gieseler Plasticity				
Start.....°C	453	448	445	436
Fusion Temp .....°C	-	-	468	448
Max Fluid Temp .....°C	467	469	469	469
Final Fluid Temp .....°C	480	483	482	492
Solidification Temp .....°C	489	490	490	496
Melting Range .....°C	27	35	37	56
Max Fluidity.....dd/m	2.7	4.9	5.5	76
Torque .....g.in.	40	40	40	40
Dilatation				
Ti - Softening Temp .....°C	420	420	417	408
Tii - Max Contraction Temp...°C	479	474	471	455
Tiii - Max Dilatation Temp....°C	-	483	480	484
Contraction.....%	17	23	22	22
Dilatation .....%	Nil	-22	-21	29
Free Swelling Index				
F.S.I.	4½	6½	5	8

Table 4 - Petrographic analysis of component coals

Identification				
Laboratory Number.....	2153-83	2154-83	2208-83	2209-83
Description	#4133	#4096	#4093	#4130
Distribution of Vitrinite Types				
V-6.....%				
V-7.....%				
V-8.....%				
V-9.....%				
V-10.....%			0.5	
V-11.....%	5.3	0.4	2.3	4.3
V-12.....%	18.3	10.9	21.0	37.3
V-13 .....%	15.5	28.0	21.5	12.4
V-14.....%	1.6	2.5	0.5	
V-15.....%				
V-16.....%				
V-17.....%				
V-18.....%				
Reactive Components				
Total Vitrinite.....%	40.8	41.7	45.6	54.0
Reactive Semi-fusinite (1/2)....%	21.4	19.9	18.7	15.4
Exinite.....%	0.0	0.0	0.0	0.2
Total.....%	62.2	61.6	64.3	69.6
Inert Components				
Inert Semi-fusinite (1/2).....%	21.4	19.9	18.7	15.4
Micrinite.....%	3.0	4.1	4.3	2.8
Fusinite.....%	7.9	9.3	7.6	6.4
Mineral Matter.....%	5.5	5.1	5.1	5.8
Coke.....%				
Total.....%	37.8	38.4	35.7	30.4
Petrographic Indices				
Mean Reflectance.....%	1.28	1.32	1.29	1.26
Balance Index.....	2.69	3.13	2.51	1.85
Strength Index.....	5.00	5.37	5.11	4.92
Stability Index.....	47.2	47.0	50.2	53.8

Table 5 - Carbonization conditions

Test Identification Number	970	971	972	973
Date of Test	1983-02-01	1983-02-02	1983-02-08	1983-02-09
Coke Oven Identification.....	12-71	12-71	12-71	12-71
Description.....	#4133	#4096	#4093	#4130
Charge Properties				
Proximate Analysis (db) Ash.....%	9.8	9.1	9.1	10.3
Volatile Matter ....%	19.8	20.4	20.8	21.8
Fixed Carbon.....%	70.4	70.5	70.1	67.9
Moisture in Charge .....%	3.0	3.1	3.2	3.0
Minus 3.35 mm .....%	84.0	86.7	86.9	87.9
Other				
Sulphur.....	0.46	0.33	0.35	0.48
Carbonization Conditions				
Net Weight of Charge (wet).....kg	273.3	274.7	272.1	272.2
ASTM Cone Bulk Density (wet).....kg/m^3	817.0	805.8	785.0	796.2
Calc. Charge Dry Bulk Density in Oven... kg/m^3	831.4	834.6	826.6	828.2
Carbonization Results				
Gross Coking Time (at Push).....h:min	9:50	9:50	9:55	9:55
Final Centre Temp.....°C	1040	1042	1022	1040
Time to 900°C Centre Temp.....h:min	8:44	8:42	8:55	8:43
Time to 950°C Centre Temp.....h:min	9:00	8:58	9:09	9:00
Time to 1000°C Centre Temp.....h:min	9:30	9:19	9:25	9:18
Maximum Wall Pressure.....kPa	2.83	3.65	3.65	6.34
Coke Yield Actual .....%	75.6	75.4	78.4	79.2

ble 6 - Coke properties

Test Identification Number.....	970	971	972	973
Screen Analysis of Coke (cum. % retained on)				
100 mm sieve.....%	2.8	1.7	0.8	1.0
75 mm sieve.....%	13.2	8.7	8.1	6.9
50 mm sieve.....%	52.9	41.7	44.9	47.3
37.5 mm sieve.....%	76.5	69.3	73.3	75.1
25.0 mm sieve.....%	92.7	93.1	93.0	94.2
19.0 mm sieve.....%	94.5	95.1	94.5	96.0
12.5 mm sieve.....%	95.2	96.0	95.6	96.9
Total -12.5 mm (breeze).....%	4.8	4.0	4.4	3.1
Mean Coke Size.....mm	54.1	49.8	50.5	51.3
Coke Chemical Analysis				
Proximate Analysis (db)				
Ash.....%	12.0	11.0	11.2	12.6
Volatile Matter.....%	1.0	1.0	1.4	0.8
Fixed Carbon.....%	87.0	88.0	87.4	86.6
Sulphur (db).....%	0.43	0.32	0.35	0.49
Coke Apparent Specific Gravity.....	1.01	1.03	0.91	0.98
ASTM Coke Tumbler Test				
Stability Factor (cum. % + 25.0 mm).	49.8	52.5	51.8	55.7
Hardness Factor (cum. % + 6.3 mm).	65.9	69.8	67.3	69.4
JIS Coke Tumbler Test (cum. % retained on)				
30 revs: 50 mm sieve.....%	6.0	4.3	17.6	13.9
25 mm sieve.....%	84.7	85.2	87.2	88.0
15 mm sieve.....%	92.5	93.4	92.0	93.7
150 revs: 50 mm sieve.....%	0.0	2.1	3.6	3.5
25 mm sieve.....%	66.7	65.2	67.0	71.7
15 mm sieve.....%	79.5	82.5	79.8	83.3

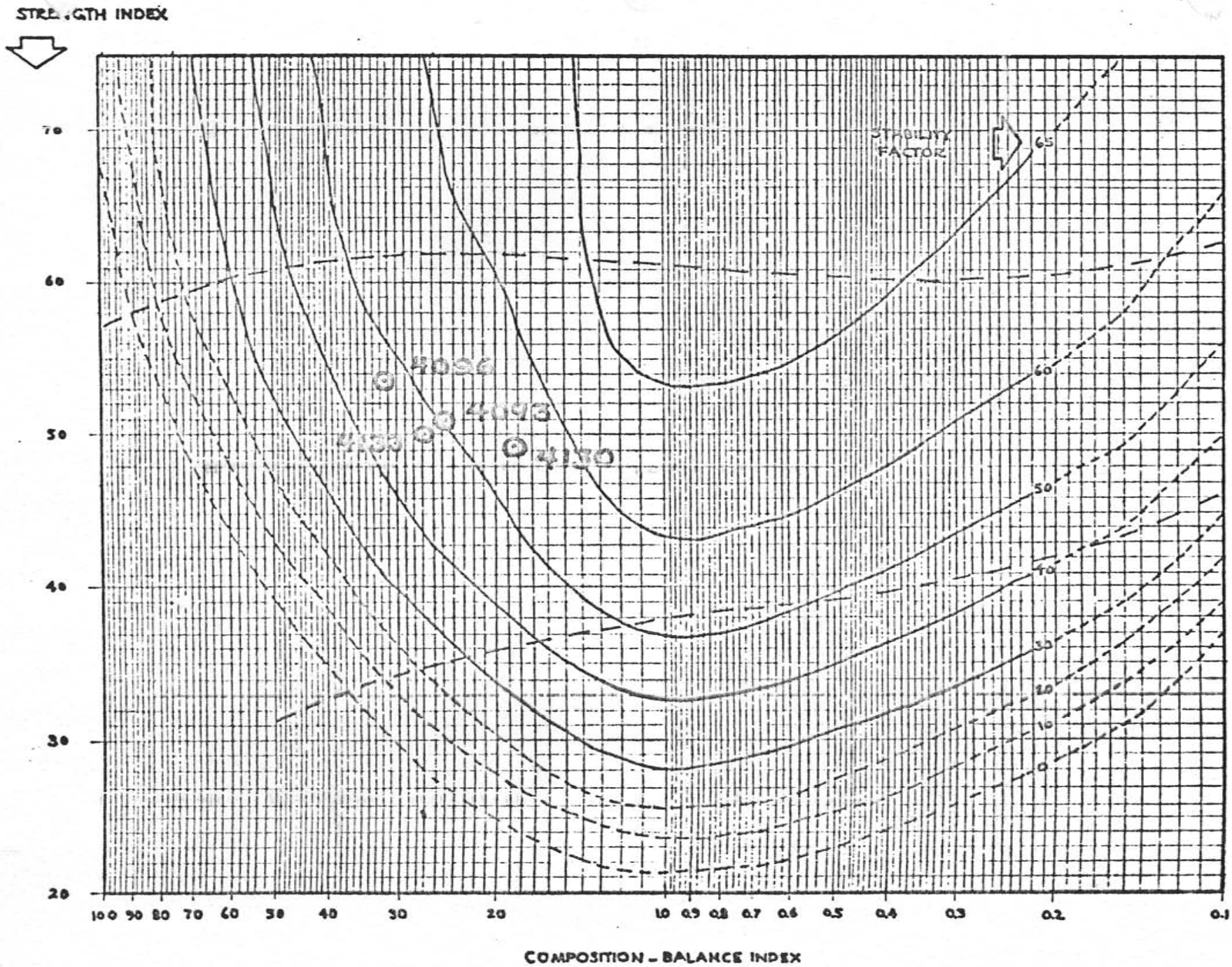
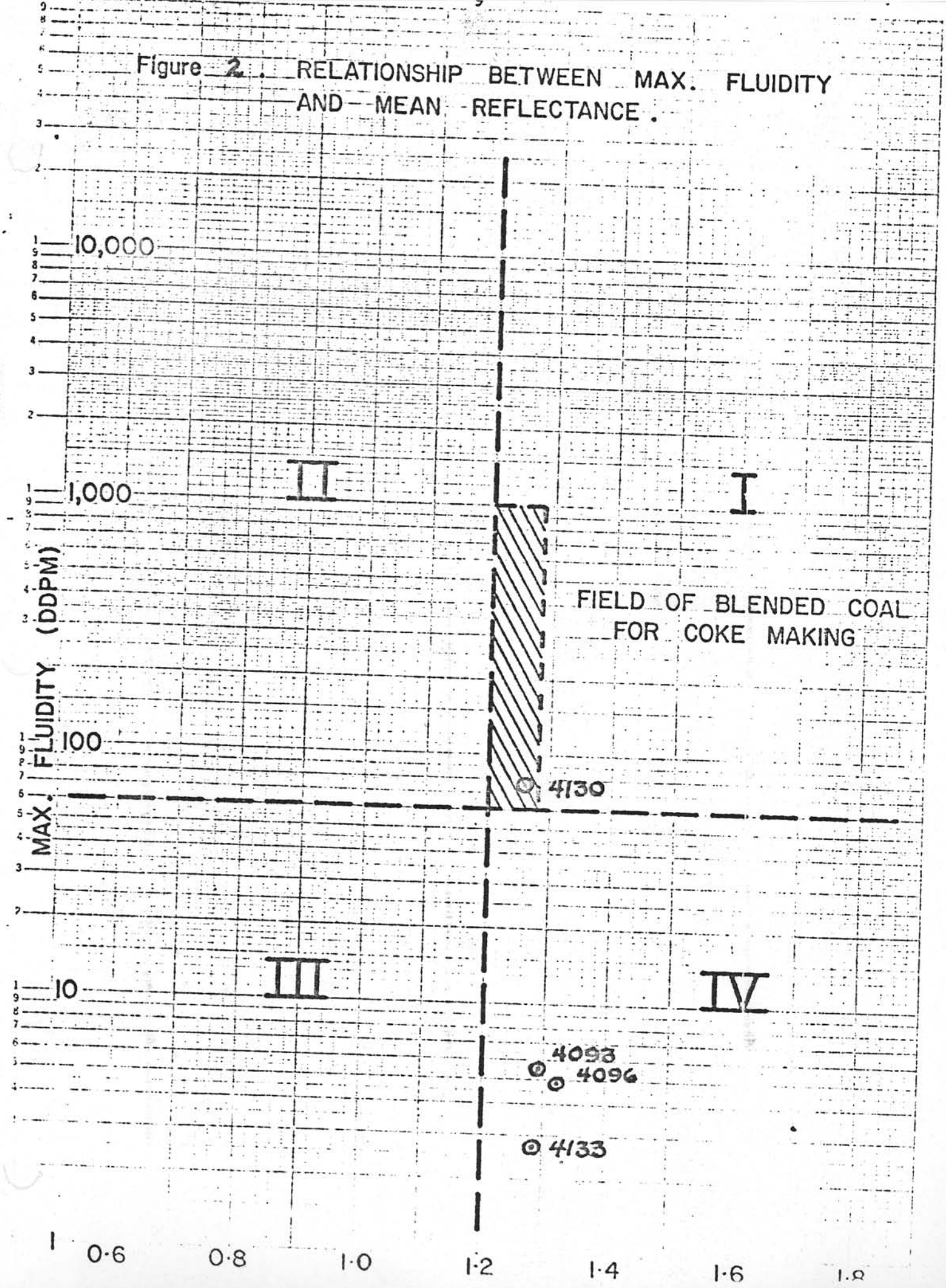


Fig. 1 - Plot of the stability factors of the component coals from petrographic data

Figure 2. RELATIONSHIP BETWEEN MAX. FLUIDITY AND MEAN REFLECTANCE.



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