PR - SUKUNKA - 73 (1) A

COKE OVEN AND BLAST FURNACE TEST OF SUKUNKA COAL

BY

BRITISH STEEL CORPORATION
PORT TALBOT, WALES

JOSEPH D. DOHERTY CONSULTANT - COAL AND COKE

Rec'd from T. Phillips Sept 17.

PLANT TEST

OF

SUKUNKA COAL

IN

COKE OVENS AND BLAST FURNACES

OF

BRITISH STEEL CORPORATION, PORT TALBOT, WALES

Huntington, West Virginia

July 16, 1973

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SUMMARY

To determine the suitability of Sukunka coking coal as one of the main constituents of the coal blend at the Port Talbot Works of the British Steel Corporation, and as a replacement for the Welsh prime coking 301A rank coals, a plant coke-oven and blast-furnace test was conducted using 10,000 tons of raw Sukunka coal, as a coal cleaning plant at the mine had not been installed.

Preliminary cleaning of smaller quantities of coal in equipment of the same type as that to be used for commercial washing at the mine demonstrated that the specifications of 4.5% ash and 0.55% sulphur can be readily achieved. Extensive pilot-oven testing of this product in mixtures of interest to British Steel Corporation showed that it could replace Welsh 301A prime coking coals, maintaining or improving the coke strength and at the same time improving the ash and sulphur contents of the coke.

Because of the inadequacies of the obsolete coal washery at Port Talbot and the inadvertent contamination in Canada of the trial cargo with large rock, the washery product for plant test contained 6.3% ash and 0.63% sulphur, rather than the specification figures of 4.5% ash and 0.55% sulphur. The washing difficulties also decreased the rate of clean coal production and required a reduction in the percentages of Sukunka from the planned 20% to 17.9% of the coal blend.

Despite the substandard quality and reduced percentage of Sukunka, the results were favorable both at the coke plant and the blast furnace. In this test the use of 17.9% Sukunka and a 9% increase of Welsh low-volatile

coal permitted elimination of 27½% 301A prime coking coals and also another 10% of U.S. strong coking coals. The net increase in imported coal was only 8.3% and Welsh open-cast coal was increased from 10% to 20%.

At the coke plant there were no operating difficulties with the test blend and the coke produced was improved both chemically and physically. One dramatic and desirable effect of the Sukunka coal was to reduce the top size of the coke, thus improving it for the blast furnace and obviating or reducing the crushing now practiced. The most important coke strength figures for the blast furnace, the Micum 10 and the Micum Slope, were both markedly improved.

In the blast furnace the test coke made with Sukunka coal gave smooth operation and improved results. The hourly production rate of iron increased 11.7% with a reduction in the coke rate.

Calculations on the effect of using 20% of commercially-cleaned Sukunka coal with the specification analysis indicate, on the basis of ash and sulphur differences only, a further increase of about 2% in iron production and 2% further reduction in coke rate. An additional improvement in blast furnace performance will no doubt result from improved coke physicals and uniformity.

This plant test demonstrated conclusively that Sukunka is an outstanding coking coal.

PLANT TEST OF SUKUNKA COAL IN COKE OVENS AND BLAST FURNACES OF BRITISH STEEL CORPORATION, PORT TALBOT, WALES

Introduction:

Because of a continuing decline in availability of prime coking coals from South Wales, and an expanding demand for coking coal, it is planned to supplement the reduced quantity of the South Wales coals with imported coals having the required coking characteristics. As the Port Talbot plant is on tidewater with the port facilities for receiving large ships, it is planned to use imported prime coking coals at this plant. Sukunka coal cleaned in a small-scale preparation plant, having the same type of equipment that will be used in the commercial plant at the mine, was used for pilot-oven tests which demonstrated that this coal could be used in place of the Welch prime coking coals giving high coke strength and improved analysis. Therefore, arrangements were made to test Sukunka on a plant scale in some of the coke ovens and blast furnaces at Port Talbot.

Test Coal

For this test, a cargo of 10,000 tons of Sukunka raw coal was shipped to the plant, arriving early in 1973. The intention was to clean this coal in the coal-washing plant at Port Talbot and it was thought that because of the favorable washing characteristics of the Sukunka coal, this plant, despite its lack of modern equipment, could produce a product approaching that expected in commercial cleaning at the mine. However, considerable difficulty was encountered,

owing chiefly to the inadvertent contamination of the Sukunka coal with rock ranging up to six inches in diameter. This phase of the test is covered in a separate report by Mr. Lister Maltman.

It was not possible to obtain a cleaned product equal to that which will be commercially available but, since a large proportion of the free impurities were separated, the deleterious effect of these materials on the coke strength was reduced. Calculations can be made to show the effect of the higher ash in this cleaned coal on the blast furnace performance and the improved results to be expected with the specification Sukunka product. However, it should be noted that a product cleaned at the mine in a modern preparation plant and dried to a consistent moisture will be appreciably better than the cleaned Sukunka tested at Port Talbot in a number of respects. Moisture, ash, and sulphur will be lower; the proportion of fines to coarse coal will be consistent; and the product will have a much higher degree of uniformity.

Preliminary Testing of Sukunka Coal

Extensive testing by British Steel Corporation of cleaned Sukunka coal in moveable wall test ovens using coal mixtures of interest to BSC led to the conclusion that Sukunka is a prime coking coal of low ash and sulphur content. One of the preferred areas for use was South Wales. The coal for these tests was cleaned in a pilot plant using the same types of equipment that will be installed at the Sukunka mine. The evidence from this testing indicated that Sukunka is an excellent coal for use at Port Talbot as a replacement for the 301A, South Wales coals.

Further testing of Sukunka coal by BCRA was reported in February, 1973. However, in the first series of tests of Sukunka and Peakdowns coals in blends, nearly all of the tests had a substantial percentage of Llanhilid, open-cast coal which was oxidized. Test No. 180, which had the following composition: Llanhilid (oxidized) 30%, Sukunka 28%, Peakdowns 12%, Ogmore 30%, gave a coke with an M10 of 8.6 demonstrating that this combination of Sukunka, Peakdowns, and Ogmore could absorb 30% of oxidized open-cast coal, an appreciably higher percentage of open-cast coal than used for the plant test.

When the BCRA tests were repeated with fresh Llanhilid coal, the Sukunka used was hand-picked raw coal containing 8.5% ash, which is not comparable to the cleaned Sukunka coal used in the previous tests or that which will be shipped commercially.

Individual Coals

The characteristics of the individual coals used prior to and during the Sukunka plant test are shown in Table I. This table gives two sets of figures for Sukunka coal, the specifications for commercial shipments of coal cleaned and dried at the mine, and the average analysis of the product from the Port Talbot coal washery, which was relatively ineffective in cleaning this coal.

Table II presents analyses of cleaned Sukunka as sampled at the blending bunkers during the test. These results show that the cleaned product was not only high in ash but also quite variable in ash content. The commercial product is expected to be at the specification ash level and very uniform.

• FOR TABLE II : ANALYSES OF SUKUNKA COKE
SEE : PR - SUKUNKA 73(4)A
CONFIDENTIAL ANALYSIS FILE

For:

DESCRIPTION OF THE PLANT - COAL HANDLING
- COKE OVENS
- BLAST FURNACE

COKE PLANT RESULTS

TABLE I: CHARACTERISTIC INDIVIDUAL COALS

TABLE II: ANALYSES OF SUKUNKA COAL

TABLE III: SUMMARY OF DATA ON MIXED COAL AND COKE

TABLE IV: DATA ON DAILY AND WEEKLY REPORTS

TABLE V: PERFORMANCE OF Nº 2 BLAST FURNACE
- BLAST AND TEST PERIODS.

refer to:

PR - SUKUNKA 73 (4)A
CONFIDENTIAL ANALYSIS FILE

PR- SUKUNKA 73(4)A

COAL ANALYSIS

GEOLOGICAL BRANCH
ASSESSMENT REPORT

00651

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Description of the Plant - Coal Handling

Coal is received at the Port Talbot Works either by rail or water. Recently improved port facilities can handle very large vessels for either coal or ore and the plant has extensive areas for storage of these materials. There are two coke plants but the Sukunka coal was tested only in the Margam Coke Works. This plant consists of 230 Simon Carves underjet coke ovens divided into two operating units, Margam A and Margam B.

The Margam Coke Works has a coal washing plant consisting of jigs for the + 1/2 mm coal and froth flotation for the - 1/2 mm. Formerly a sizeable percentage of the coal used was cleaned in this plant but, as only cleaned coal is expected to be received in the future, plans are being made to dismantle the coal washery.

To facilitate draining of the + 1/2 mm washed coal, a large number of bins were provided so that the coarse coal could be retained until it had drained to a moisture content of about 6%. Therefore, the plant now has 46 mixing bins equipped with a feeder and weighing devices. As these devices are not highly accurate, weights of each coal actually used are determined by gauging the volume of coal removed from each bin. After blending, the mixed coal is crushed in a swing hammer crusher to about 80% - 1/8 in. No water or oil is added. The mixed coal normally contains about 8% moisture and has a bulk density of about 50 lbs. per cubic foot.

At the oven bins, the coal is fed with a rotating feeder belt discharging the coal approximately mid-way between the walls and the center of the bin to minimize any tendency to segregate.

Description of the Plant - Coke Ovens

No. of ovens		230
Make and Type		Simon Carves underjet
When built		No. 2 1951, No. 3 1951, No. 3a 1957, No. 4 1956, No. 5 1957
Oven height		
Floor to roof		12' 7-3/4"
Floor to coal line		11' 6"
Oven length		42' 4" Door to door
Average width		17-3/4"
Taper		3 inches
No. of charging holes		4
Volume to coal line		720 cubic feet
Flue Temp.	Flue C. S.	1,314°C
	Flue P. S.	1,278°C
Coking time	Gross	19 hours
	Net	18-3/4 hours
Number of pushes/day		147
Total tonnage coke/week		25,000 tons

At the time of these tests, the heats were quite uniform and the oven walls relatively free from carbon deposits as would be expected with the low volatile matter of the mix and the fairly high moisture content.

Description of the Plant - Blast Furnace

Although the test coke was used on other blast furnaces as well, the No. 2 furnace was used to evaluate the results. Data on this furnace follows:

Furnace Data

Furnace number	2
Hearth diameter	27' 3"
Height	C/L tuyeres - stock lever spprox. 74 ft.
Working volume	48,550 cubic feet
Size and number of blowers	One
Number of tuyeres	16
Size of tuyeres	6-1/2"
Number of stoves	3
Heating surface of stoves	$3 \times 200 \times 10^3$ sq. feet

Furnace Operation (Typical)

Wind at 60 F. CFM	73,000
Blast pressure, PSI	17 (Furnace differential 15.5 PSI)
Moisture in blast, Grs./Cu. ft.	Atmospheric moisture only
Blast temperature	830 - 860°C
Top pressure	NIL (Normal back pressure 1.5 lbs/in.^{2})
Top temperature	300 - 360°F

This furnace was in good condition and had been operating exceptionally well for several weeks prior to the Sukunka test.

Individual Coals

The characteristics of the individual coals used prior to and during the Sukunka plant test are shown in Table I. This table gives two sets of figures for Sukunka coal, the specifications for commercial shipments of coal cleaned and dried at the mine, and the average analysis of the product from the Port Talbot coal washery, which was relatively ineffective in cleaning this coal.

Table II presents analyses of cleaned Sukunka as sampled at the blending bunkers during the test. These results show that the cleaned product was not only high in ash but also quite variable in ash content. The commercial product is expected to be at the specification ash level and very uniform.

Coke Plant Results

Summary Table III, "Summary of Data on Mixed Coal and Coke", gives the regular plant mix before the Sukunka test and both the proposed and actual Sukunka mixes.

It will be noted that the plan for the plant test was to double the content of open-cast coal from 10-20%, and reduce the strong coking coals by 38.5% (reductions: Sewell 5.5%, Marine 301A 27.5%, and Pocahontas 5.5%). These changes were to be offset by adding 20% of Sukunka and increasing Ogmore 8-1/2%, certainly a severe test for the Sukunka coal. In the actual plant test, only 17.9% of Sukunka was actually used and as this coal was not fully cleaned (chiefly because the cleaning plant is not suitable for this type of coal) the ash content was 6.3% rather than the 4.5% expected in commercial shipments. Therefore, the actual plant test was an even more severe test of the Sukunka coal than planned.

Summary Table III also presents the analyses and physical properties of the resultant cokes. The figures show that the test coke was 0.3% lower in ash content and that the coke was stronger, harder, and significantly smaller than the coke during the six-week period ending April 21st.

These results confirm the findings of pilot-oven tests that Sukunka is very effective in building up the strength and hardness of the coke when mixed with high volatile coals that would make a poor coke by themselves, and that Sukunka tends to make a coke with a reduced top size but with a small percentage of breeze. Previous tests had also indicated that coke made with Sukunka coal tends to be lower in apparent specific gravity, a favorable characteristic for the blast furnace.

Table IV, Data from Coke Works' Reports, gives the daily figures which show a definite change in the coke starting on May 10th and continuing for the six days of the test. Both the mean size and percent + 80 mm were markedly reduced, the M-40 was slightly higher, and there was a definite improvement in the M-10 index and the Micum Slope, probably the most significant figures for the blast furnace.

It may be noted that at the end of the test the coke size again increased when Blue Boy was substituted for Sukunka. This is not surprising as Blue Boy is a strong coking coal used primarily in the United States for the production of foundry coke where large, dense coke is desired.

The smaller size coke made with Sukunka is better for the blast furnace and it is obtained without using coke cutters which increase the breeze yield.

The reduction in size with no increase in breeze suggests that if the relative prices of oil and small coke favor it, a higher percentage of the coke could probably be used in the blast furnace with coke from the Sukunka mix. Since the top size is smaller, the bottom size could be reduced; or a separate smaller size fraction could be charged if coke-handling facilities permit this practice.

Note: In tables III and IV, this report uses 9-14 May as the test period for mixed coal data, and 10-15 May for coke and blast furnace data. The BSC Report uses 9-14 May for coal, 10-14 May for coke and 9-14 May for the blast furnace. Table V of this report was prepared by BSC and reflects its dates for the blast furnace test.

Description of Coke

Run-of-oven coke was inspected on the wharf and on the wharf belt. Notes taken on the regular coke just before the Sukunka tests are as follows:

Size:	Large.
Shape:	Generally blocky; some steppy pieces.
Cells:	Small; cross break brighter on one surface than on the other. This is a characteristic of medium volatile coal.
Free Impurities:	Moderately large amount.
Color:	Light gray - uniform.
Sponge, free:	Practically none.
Spongey ends:	Prevalent but generally shallow.
Long Fractures:	Moderate amount.
Cross Fractures:	Moderate amount.
Break:	Square to steppy, shape of broken coke generally cubical.
Surface:	Smooth on full length pieces, rough on cross breaks, fairly smooth on longitudinal breaks.
Cauliflower:	Moderately deep.
Ring:	Poor, especially for a silvery coke.
General:	A good, uniform blast furnace coke.

Sukunka Coke

On May 10th and 11th, coke made from a coal mixture containing 17-20% of Sukunka coal was examined on the wharf and wharf belt. This test coke was similiar in most characteristics to the regular coke but was generally smaller in size and the spongey ends were less pronounced. The ring of this coke was classed as fair - better than the regular.

It was reported that this test coke pushed easily - better than the regular.

Blast Furnace Results

Because of the short duration of the blast-furnace test, the results must be considered as a general indication rather than a measure of the relative values of the two cokes.

Table V, "Performance of No. 2 Blast Furnace - Base and Test Periods" prepared at Port Talbot gives figures for the two periods as indicated with percentage changes. The most dramatic figure is an increase in iron production of 11.7% on an hourly basis. While an increase should be expected with the smaller, lower-ash coke, it is likely that other factors contributed to this increase as shown in Table 15 "Effect of Blast Furnace Operating Conditions on Coke Rate" in the BSC report. However, some factors included such as slag volume reduction with the Sukunka coke were at least partially the result of the lower ash and sulphur in the test coke.

Tables III and IV show that the Sukunka ash content and the coke ash content increased as the test progressed. But the coke ash increase was chiefly due to the other coals as the variation in Sukunka accounts for only 0.4% of the 1.1% increase in coke ash from the first two days to the last two days.

Even though data from the short test do not provide precise measurements because of variables that cannot be controlled, calculations for long-term blast furnace performance with changes in coke ash and sulphur can be quite accurate. In making calculations, all factors are assumed constant except the analysis of the coke.

Such a calculation has been made to show the effect of using 20% of specification grade Sukunka in place of the 17.9% actually used.

For this calculation, it was necessary to assume that the other coals in the blend would remain in their same proportions as for the test and that, of course, their quality would be constant. This calculation, based on the Flint formulas, shows that with 20% specification Sukunka coal, the coke rate would have been 1.9% lower and the iron production rate 1.9% higher. The actual benefits with 20% specification grade Sukunka coal should be appreciably greater than these figures because of the lower moisture content, better coking characteristics with lower ash, and the uniformity of the cleaned coal.

Summarizing, the test coke performed well in the short blast furnace test, giving smooth operation, increased iron production, and a reduced coke rate. Even better results are to be expected with specification-grade Sukunka coal with lower moisture, lower ash, lower sulphur, and greater uniformity.

Conclusions

A coke plant test at Port Talbot with 17.9% of Sukunka and 9.1% Ogmore L.V. replacing about 38% of strong coking coals and absorbing a 10% increase of open-cast high-volatile coals gave very good results. Even though the Sukunka was cleaned only to 6.3% ash as compared to 4.5% specified for commercial shipments, the coke strength was improved, the coke ash and sulphur lowered, and the size of the coke was smaller - a very favorable point.

In the brief blast furnace test the iron production on an hourly basis was increased 11.7% and the coke rate decreased.

With Sukunka coal cleaned and dried at the mine to 4.5% ash and 0.55% sulphur, the improved analysis and uniformity will give even better coke and improved blast furnace results, and the use of the full 20% in the mix will provide further improvement.

This test provides proof that Sukunka coal is an excellent coking coal.

Acknowledgement

The many courtesies and the outstanding cooperation of the British Steel Corporation officials and their operating and technical staffs are gratefully acknowledged.

Submitted by

J. D. Doherty

Joseph D. Doherty

JDD:lm

16th July, 1973

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TABLE I

INDIVIDUAL COALS

% Sulphur Dry Basis	Swelling Index	Gray King Coke Type	Gieseler Max. Fluidity	Dilation Ruhr Dilatometer
1.03	7 - 8	G5 - G8	NA)	37
1.12	$6\frac{1}{2}$-$7\frac{1}{2}$	G5 - G7	NA)	
0.86	8 - $8\frac{1}{2}$	G7 - G8	9000	26
0.90	7 - 8			
0.82	9	G - 9	325	115
0.55	8 - 9	G -10	204	48
0.63	$7\frac{1}{2}$-$8\frac{1}{2}$	G6 - G8	202	28
0.81	7 - $7\frac{1}{2}$	G - 3	9.8	24
.70	8 - $8\frac{1}{2}$	G7 - G8	288	22

CHARACTERI

	% Moist As Rec'd.	% VM Dry Basis	% Ash Dry Ba
HIGH VOLATILE COALS			
Open Cast: Mill Pit	6.3	29.4	7.6
Llanhilid	5.8	30.8	8.0
Pittston Sewell	7.0	28.6	6.9
MEDIUM VOLATILE COALS			
Marine (301A) (1)	8.1	23.0	9.2
Peakdowns (2)	9.6	22.3	8.3
Sukumka (3)	6.0	22-23.5	4.5
Sukumka	10.5	23.4	6.3
LOW VOLATILE COALS			
Ogmore/Royal Arms	8.0	17.6	6.2
Pittston Pocahontas	7.7	20.5	8.1

(1) Declared Analysis

(2) Specification analysis for commercially cleaned coal

(3) Proximate analysis of coal as cleaned at Port Talbot works

NOTE: Other data from BSC report by D. G. Williams dated 14th Februar

JDD:dh

12th June, 1973

TABLE II
ANALYSES OF SUKUNKA COAL
SAMPLED AT
BLENDING BUNKERS
FROM COKEWORKS' DAILY REPORTS

Date of Report	Time	% VM	% Ash	Swelling No.
8th May	7:00- 9:00 A.M.	25.5	3.1	8
	6:00-10:00 P.M.	23.2	7.4	-
9th May	10:00-12:00 A.M.	22.7	6.0	7½
	6:00- 9:00 P.M.	23.3	5.1	8
	2:00- 6:00 A.M.	23.1	-	7½
10th May	10:00-12:00 A.M.	23.9	6.5	7½
	6:00- 7:30 P.M.	24.4	4.7	8½
	2:00- 4:00 A.M.	23.2	5.9	8
11th May	6:00- 7:30 P.M.	23.5	6.7	-
	12:30- 5:00 A.M.	23.6	-	-
12th May	8:00- 9:00 A.M.	23.5	4.5	8
	10:00-11:30 A.M.	22.9	6.2	8
	2:00- 5:00 P.M.	23.4	7.6	8½
	6:00- 7:15 P.M.	23.4	-	-
13th May	6:00- 6:30 A.M.	22.6	7.2	8
	2:00- 4:15 P.M.	22.7	6.9	8
	10:00- 1:00 A.M.	23.4	7.3	7½
14th May	6:00- 9:00 A.M.	23.1	6.8	8
	2:00- 5:00 P.M.	23.3	7.1	8
	6:00- 7:00 P.M.	22.6	7.5	8
	10:00- 3:30 A.M.	-	-	-
Average		23.37	6.26	7½/8½

JDD:dh

6th June, 1973

TABLE III

SUMMARY OF DATA ON MIXED COAL AND COKE

		Reg. Mix Nominal or Target	Actual 6-Weeks Ending 21 April	Sukunka Mix Nominal or Target	Actual Sukunka Mix Avg. 9-14 May
COAL MIX:					
Open Cast HV Mill Pit/Llanhilid	%	10		20.0	20.0
Pittston Sewell HV	%	17		11.5	12.3
Marine 301A MV	%	27.5		-	-
Peakdowns MV	%	8.5		8.5	9.1
Low Vol. 203/204 Ogmore	%	31.5		40.0	40.7
Pocahontas	%	5.5		-	-
Sukunka	%	-		20	17.9
Mixed Coal Analysis				Calculated	
Moisture As Received	%	8.0	8.1	7.8[1]	8.5
Volume Matter Dry	%	23.0	23.35	22.97	23.25
Fixed Carbon "	%		68.82	70.43	69.47
Ash "	%	8.0	7.83	6.61	7.28
Sulphur "	%	1.0	1.00	0.82	
FSI			7/7½		7½-8½
Gray King			3/4		
Bulk Density Coal lb/cu. ft.		50.0	49/51		
Pulv. of coal % - 1/8 in.		Not Less Than 80%	79.56		80.65
Coke Yield; As % of Dry Coal					
Total Dry Coke	%	78.71			78.76[2]
Total Dry Furnace Coke	%	73.04			73.4
Coke Analysis					Avg. 10-15 May
Moisture As Received	%		5.5		5.6
Volume Matter Dry	%		0.7		0.7
Fixed Carbon "	%		89.8		90.4
Ash "	%		9.5		8.9
Sulphur "	%		0.85		
Physical Tests of Furnace Coke					
Mean Size			73.4		65.7
Micum 40			72.64		73.48
Micum 10			8.03		7.1
Micum Slope			1.11		1.03
Coke App. Spec. Gravity			0.94		

1 Assuming 10.5% Moist. in Combined Cleaned Sukunka
2 Week Ending May 12

JDD:vk
15th June, 1973

Performance of No. 2 Blast Furnace - Base and Test Periods.

TABLE V

		Base Period Wk end. 5th May	Test Period 9th May to 14th May '73	% Change
Operating Days		7	6	
Delays, % of Total Time	%	9.5	0	
Average Daily Iron Production	MT	1673	2064	+23.4
Net Dry Coke Rate	Kg/MTHM	481.4	476.5	- 1.0
Fuel Oil Rate	" "	48	46	- 4.2
Wind at Standard Pressure & Temp.	cu.M/Hr.	120,813	125,007	+ 3.5
Wind Rate	cu.M/Hr/Cu.M	88.6	91.6	+ 3.5
" "	CFM/cu.ft.W.V.	1.46	1.51	+ 3.5
Blast Pressure	Kg/sq.C.M.	1.18	1.27	+ 7.6
Blast Temperature	Deg. C.	793	870	+ 9.7
Blast Temperature	Deg. F.	1459	1598	+ 9.5
Moisture in Blast	gms/cu.M	16	10	-37.5
" " "	grs/cu.ft.	7.0	4.37	-37.5
Top Temperature	Deg. C.	280	300	+ 7.1
Dry Metallic Burden	Kg/MTHM	1513	1531	+ 1.2
Fe in Metallic Burden	%	63.9	64.3	+ 0.6
Limestone	Kg/MTHM	79	60	-24.0
Metallic Burden Slag	Kg/MTHM	152	138	- 9.2
Coke ash slag	" "	37.9	35.4	- 6.6
Total Slag Volume	" "	264	234	- 5.3
Flue Dust	Kg/MTHM	23.1	28.3	+22.5
Top Temperature	Deg. C.	280	300	+ 7.1
" "	Deg. F.	536	572	+ 6.7
Avg. number of checks/24 hrs.		2	2	
Days on Lining to Middle of Period		774	783	+ 1.2
Number of Tuyers replaced		0	0	
Iron Analysis				
Silicon	%	0.9	0.7	-22.3
Sulphur	%	.024	.029	+20.4
Manganese	%	0.78	0.75	- 4.2
Phosphorus	%	0.10	0.10	

TABLE V CONTD.

		Base Period Wk. End. 5th May	Test Period 9th May to 14th May '73	% Change
Iron Temperature	Deg. C.	1479	1465 (calculated)	-1.1
" "	Deg. F.	2694	2669	-1.1
Slag Analysis				
Silica	%	34.4	35.3	+ 2.6
Alumina	%	14.0	12.4	-11.4
Lime	%	40.2	38.1	- 5.2
Magnesia	%	9.2	9.3	+ 1.1
Barium Oxide	%	-	-	
Manganous Oxide	%	0.7	0.75	
Ferrous Oxide	%	0.5	0.5	
Sulphur	%	1.40	1.37	- 2.1
Slag Basicity - $(CaO+MgO)\div(SiO_2)$		1.41	1.34	- 5.0
- $(CaO+MgO+BaO)\div(SiO_2+Al_2O_3)$		1.02	0.99	- 2.9
Slag % Sulphur ÷ Iron % Sulphur		58	47	-19.0
Coke Ash		9.45	8.91	- 6.7

JDD:dh

10th July, 1973

TABLE I.

REPORTS FOR 24 HOURS ENDING AT 6 A.M. ON DATE SHOWN

May 8th	May 9th	May 10th	May 11th	May 12th	May 13th(b)	May 14th	May 15th	May 16th	Six Day Avg.
3.1	16.9	19.6	17.4	17.8	17.5	18.4			17.9
8.6	8.0	8.6	8.4	8.9	8.5	8.7	9.9	8.3	8.5
3.2	23.3	23.3	23.6	23.6	23.0	22.7	22.9	23.1	23.25
7.3	7.3	6.2	7.1	7.2	8.0	7.9	7.4	6.9	7.28
7½	7½	7½	7½	7½+	7½/8	7½/8½	7½/8	8	7½/8½
1.2	9.2	10.9	13.2	NA	NA	NA	NA		11.1
2.1	83.5	81.2	78.2	79.7	NA	NA	80.6	81.3	80.65
5.7	7.8	5.0	6.8	5.9	6.2	5.6	3.9	2.2	5.6
0.78	0.75	0.50	0.66	0.83	0.72	0.68	0.78	0.51	0.7
9.10	8.80	8.65	7.54	9.20	9.75	10.0	8.35	8.30	8.9
0.12	90.45	90.85	91.80	89.97	89.53	89.32	90.87	91.19	90.4
NA	75.3	63.9	59.4	63.3	66.7	64.0	76.9	73.8	65.7
	40.0	23.0	20.6	24.3	27.9	22.6	32.4	38.3	25.1
	72.2	72.2	69.1	73.1	74.9	74.9	76.7	75.5	73.5
	9.2	7.0	7.1	7.1	7.1	6.6	7.5	6.8	7.1
	1.11	0.96	1.27	0.93	0.87	1.03	1.04	0.96	1.03

DATA FROM MARGAM COKE WORKS' WEEKLY REPORTS AND

		Avg. 6 Wks. ending 21st April	Avg. Wk. ending 28th April	Avg. Wk. Ending 5th May	May 6th	May 7th
Coal Mix:						
% Sukunka					1.7(a)	1.6
Coal As Charged Analysis:						
Moist		8.1			7.4	8.3
VM	Dry Basis	23.35			23.0	23.2
Ash	" "	7.83			7.5	7.6
Sulphur	" "	1.00				
Swelling	" "	7/7½			7½	7½
Size Total + 1/4" %					10.9	10.0
- 1/8" %		79.56			82.7	82.8
Coke (Avg. A & B Plants) Analysis:						
% Moist		5.5			3.8	4.0
% VM	Dry Basis	0.7			0.84	0.70
% Ash	" "	9.5			8.85	8.75
% F.C.	" "	89.8			90.31	90.55
% Sulphur	" "	0.85				
Physicals: Furnace Coke						
Mean Size		73.4	77.9	69.1	NA	79.0
% + 80 mm			44.6	32.3	"	42.7
M40 Index		72.6	73.4	74.2	"	73.6
M10 Index		8.0	8.1	6.8	"	10.4
Micum Slope		1.11	0.96	0.98	"	1.04

(a) Flotation slurry (cleaned fines)

(b) Last of Sukunka from blending bins

JDD:dh

6th July, 1973