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

PETROGRAPHIC AND RELATED ANALYSES OF CLEANED COAL SAMPLES FROM NO. 26 COLLIERY AND LINGAN COLLIERY SUBMITTED BY CAPE BRETON DEVELOPMENT CORPORATION, SYDNEY, NOVA SCOTIA.

Project No. 03-1-3/10-14
Job No. 3288R

J.G. JORGENSEN
COAL RESOURCE AND PROCESSING LABORATORY

DECEMBER 1980

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by

J.G. JORGENSEN*

INTRODUCTION

This report deals with the laboratory analyses of two coal samples cleaned at the Victoria Junction Preparation Plant and identified as follows:

(a) coal from No. 26 Colliery operating two longwalls at 13 North and 13 South;

(b) coal from Lingan Colliery operating three longwalls at 2 West, 5 East and 6 East.

The project was initiated by J.C. Campbell, P. Eng., Product Engineer, Cape Breton Development Corporation, Sydney, Nova Scotia. The covering letter dated June 3, 1980 appears in Appendix 1 of this report.

The chemical, physical, thermal rheological and petrographical analyses of the coal samples are listed in Tables 1 to 4 respectively.

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*Head, Petrographic Section, Coal Resource and Processing Laboratory, Energy Research Laboratories, Canada Centre for Mineral and Energy Technology (CANMET), Department of Energy, Mines and Resources, Ottawa, Canada.

TABLE 1 Chemical Analyses of Component Coals

Identification		
Laboratory Number	3666-80	3667-80
Description	No. 26	Lingan
Classification		
Rank (ASTM)	hvAb	hvAb
International System	635	635
Specific Volatile Index	176	170
Carbon (dmmfb) %	87.4	86.0
Proximate Analysis (db)		
Ash %	2.4	2.7
Volatile Matter %	35.1	37.5
Fixed Carbon %	62.5	59.8
Gross Calorific Value (db)		
Btu per pound	15200	14980
Ultimate Analysis (db)		
Carbon %	85.1	83.4
Hydrogen %	5.6	5.7
Sulphur %	0.75	1.31
Nitrogen %	1.6	1.6
Ash %	2.4	2.7
Oxygen (by difference) %	4.5	5.3
Ash Analysis (db)		
SiO_2 %	34.8	27.5
Al_2O_3 %	22.2	17.8
Fe_2O_3 %	30.7	45.0
TiO_2 %	1.2	0.9
P_2O_5 %	0.2	0.1
CaO %	2.0	1.8
MgO %	1.2	1.0
SO_3 %	1.5	1.3
Na_2O %	1.3	1.2
K_2O %	1.2	1.6

TABLE 2 Physical Tests and Fusibility of Ash of Component Coals

Identification		
Laboratory Number	3666-80	3667-80
Description	No. 26	Lingan
Coal Pulverization		
Sieve Analysis		
Passing / Retained On		
/ 1/4 in.	%	
1/4 in. / 6 mesh	%	
6 mesh / 12 mesh	%	
12 mesh / 20 mesh	%	
20 mesh /	%	
Total Passing 6 mesh	%	
Grindability		
Hardgrove Index	68	56
Fusibility of Ash		
Initial Deformation Temp. ...	°F	
Softening Temp. Spherical ...	°F	
Softening Temp. Hemispherical	°F	
Fluid Temp.	°F	

TABLE 3 Thermal Rheological Properties of Component Coals

Identification		
Laboratory Number	3666-80	3667-80
Description	J-8100 No. 26	J-8101 Lingan
Linear Expansion		
Bd. 52 lb/ft^3 at 2% moisture...%	-	-
Gieseler Plasticity		
Start .....°C	391	387
Fusion Temp. .....°C	406	402
Max. Fluid Temp. .....°C	434 & 447	431
Final Fluid Temp. .....°C	485	476
Solidification Temp. .....°C	489	480
Melting Range .....°C	94	89
Max. Fluidity .....dd/m	27,725	>28,000
Torque .....g.in.	40	40
Dilatation		
Ti - Softening Temp. .....°C	353	356
Tii - Max. Contraction Temp. °C	398	399
Tiii - Max. Dilatation Temp. °C	457	452
Contraction .....%	24	27
Dilatation .....%	268	190
Free Swelling Index		
F.S.I.	7½	7½

TABLE 4 Petrographic Analysis of Component Coals

Identification		
Laboratory Number.....	3666-80	3667-80
Description.....	No. 26	Lingan
Distribution of Vitrinite Types		
V-6.....%		
V-7.....%		
V-8.....%		21.1
V-9.....%	15.0	43.7
V-10.....%	49.3	16.2
V-11.....%	19.2	
V-12.....%		
V-13.....%		
V-14.....%		
V-15.....%		
V-16.....%		
V-17.....%		
V-18.....%		
Reactive Components		
Total Vitrinite.....%	83.5	81.0
Reactive Semi-fusinite (1/3)...%	1.4	1.3
Exinite.....%	3.5	5.6
Total.....%	88.4	87.9
Inert Components		
Inert Semi-fusinite (2/3).....%	2.8	2.6
Micrinite.....%	3.6	4.0
Fusinite.....%	3.7	3.7
Mineral Matter.....%	1.5	1.8
Total.....%	11.6	12.1
Petrographic Indices		
Mean Reflectance.....%	1.05	0.94
Balance Index.....	0.33	0.36
Strength Index.....	3.68	3.23
Stability Index.....	38.4	30.0

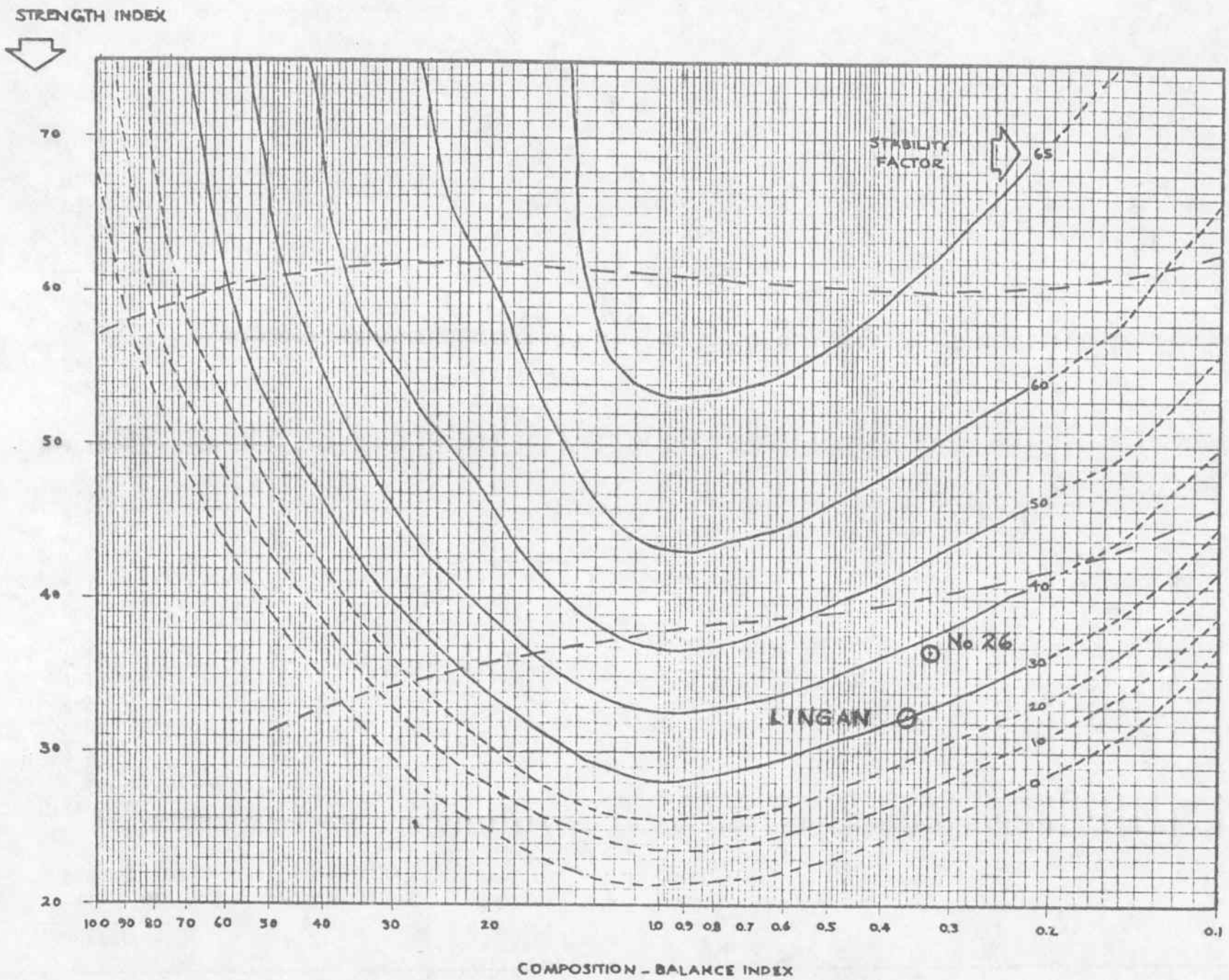

Figure 1. Plot of the Potential Stability Factors of Coal Samples from No. 26 and Lingan Collieries.

REFERENCES

1. ASTM Designation: D388-66, "Classification of Coals by Rank".

2. ASTM Designation: D720-67, "Test for Free Swelling Index of Coal".

3. ASTM Designation: D2639-71, "Test of Plastic Properties of Coal by the Constant-Torque Gieseler Plastometer". (Constant torque plastometer used with a torque of 40 gram-inch; start, ldd/m; fusion, 55dd/m; final, 1·dd/m; solidification, no movement; range-temp., between start and final temperatures).

4. Burrough, E.J., "Specific Volatile Index", Fuels Division Memorandum 97/58-CG, Fuels and Mining Practice Division, Mines Branch Dept. of M. and T.S., Ottawa, Canada.

5. German Industrial Specification No. DIN 51739/March 1951.

6. ASTM Designation: D2797-72, "Preparing Coal Samples for Microscopical Analysis by Reflected Light".

7. ASTM Designation: D2798-72, Determining Microscopically the Reflectance of the Organic Components in a Polished Speciment of Coal".

8. ASTM Designation: D2799-72, "Microscopical Determination of Volume Per cent of Physical Components of Coal".

9. Schapiro, N., Gray, R.J. "Petrographic Classification Applicable to Coals of all Ranks", Proc. Ill, Min. Inst., 1960, 68, 83-97.

APPENDIX 1

Letter dated June 3, 1980 from J.C. Campbell, P. Eng., Product Engineer, Cape Breton Development Corporation, Sydney, Nova Scotia.

Government of Canada
Cape Breton Development Corporation

Gouvernement du Canada
Société de développement du Cap-Breton

June 3, 1980

Mr. Basil I. Parsons
Chief, Energy Research Laboratories
Canmet
555 Booth Street
Ottawa.
K1A OG2

Dear Mr. Parsons:

Re: Devco Met Coal Properties

It is some time since we have checked the petrographic and coking properties of the coking coal produced by No. 26 and Lingan Collieries.

We would like to arrange for cost recovery work on washed samples of each taken from the Victoria Junction Preparation Plant.

Currently No. 26 Colliery operates 2 longwalls - 13 North and 13 South. Lingan has 3 longwalls, 2 West, 5 East and 6 East.

We would like all tests done that you feel are essential to completely define coking properties. I would suggest:

1. Proximate Analysis.
2. Ultimate Analysis.
3. Hardgrove.
4. F.S.I.
5. Ash Analysis.
6. Gieseler Plasticity.
7. Dilatation.
8. Petrographic Analysis.

We will prepare samples of about 20 Kg of Lingan and No. 26 washed coal collected over at least 1 weeks operation. Both samples will be sent prepaid in sealed plastic pails to your attention.

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P.O. Box 2500
Sydney, Nova Scotia
B1P 6K9

C.P. 2500
Sydney, Nouvelle-Écosse
B1P 6K9

We will issue the appropriate purchase order through CCRA. Could you please send current price list for this work.

Would it be possible to have even unofficial results (telephone satisfactory) by early August? We would like to use data in a paper for the CIM Conference of Metallurgists in late August.

Yours very truly,

J.C. Campbell, P.Eng.
Product Engineer

JCC:mlm