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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 A SAMPLE OF SMOKY RIVER COAL SUBMITTED BY THE SYDNEY STEEL CORPORATION NOVA SCOTIA

Project 03-1-3/17-11
Job No. 3375R

J. G. Jorgensen
Combustion and Carbonization
Research Laboratory

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ENERGY RESEARCH PROGRAM
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Petrographic and Related Analyses of a Sample of Smoky River Coal Submitted by the Sydney Steel Corporation, Nova Scotia

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by

J. G. Jorgensen

INTRODUCTION

The evaluation of coals for the Sydney Steel Corporation is a continuing divisional project in which periodic investigations are undertaken as requested by the company.

This report includes evaluation data on a sample of coal identified as Smoky River from McIntyre Mines Limited. The project was initiated in a letter dated 8 December 1981 from E. Parsons, Manager, Coke Ovens Department, Sydney Steel Corporation (SYSCO). A copy of this letter appears in Appendix 1.

The proximate analysis, sulphur level, thermal rheological and petrographical analyses are tabulated in Tables 1 to 3.

COMMENTS

This sample of Smoky River coal appears to be partly oxidized based on the lower than normal dilatation, fluidity and FSI values. The sulfranin-O stain test run on the petrographic pellet did not reveal any

*Head, Carbonization and Evaluation Group, Combustion and Carbonization Research Laboratory, Energy Research Laboratories, CANMET, Energy, Mines and Resources Canada, Ottawa, Canada K1A 0G1

any oxidation but this test is not sensitive with higher rank coals. The alkaline test for oxidation resulted in 85% transmittance at 520 nm which indicates 10% oxidation.

Table 1 - Chemical Analyses of Component Coals

Identification	
Laboratory Number.....	2102-82
Description.....	Smoky River l.v.
Classification	
Rank (ASTM).....	
International System.....	
Specific Volatile Index....	
Carbon (dmmfb).....%	
Proximate Analysis (db)	
Ash.....%	7.2
Volatile Matter.....%	17.3
Fixed Carbon.....%	75.5
Gross Calorific Value (db)	
Btu/per pound.....	
Ultimate Analysis (db)	
Carbon.....%	
Hydrogen.....%	
Sulphur.....%	0.43
gen.....%	
Ash.....%	
Oxygen (by difference)....%	
Ash Analysis (db)	
SiO_2.....%	
Al_2O_3.....%	
Fe_2O_3.....%	
TiO_2.....%	
P_2O_5.....%	
CaO.....%	
MgO.....%	
SO_3.....%	
Na_2O.....%	
K_2O.....%	

Table 2 - Thermal Rheological Properties of Component Coals

Identification	
Laboratory Number.....	2102-82
Description.....	Smoky River LV
Linear Expansion	
Bd. 52 lb/ft^3 at 2% moisture...%	
Gieleler Plasticity	
Start.....°C	-
Fusion Temp.....°C	-
Max Fluid Temp.....°C	477
Final Fluid Temp.....°C	-
Solidification Temp.....°C	495
Melting Range.....°C	-
Max Fluidicity.....dd/m	0.9
Torque.....g.in.	40
Dilatation	
Ti - Softening Temp.....°C	440
Tii - Max Contraction.....°C	486
Tiii - Max Dilatation Temp....°C	-
Contraction.....%	21
Dilatation.....%	nil
Free Swelling Index	
F.S.I.....	5½

Table 3 - Petrographic Analysis of Component Coals

Identification	
Laboratory Number	2102-82
Description	Smoky River LV
Distribution of Vitrinite Types	
V-6 %	
V-7 %	
V-8 %	
V-9 %	
V-10 %	
V-11 %	
V-12 %	
V-13 %	
V-14 %	6.7
V-15 %	19.5
V-16 %	30.4
V-17 %	4.2
V-18 %	
Reactive Components	
Total Vitrinite %	60.8
Reactive Semi-fusinite (1/2) %	13.8
Exinite %	0.0
Total %	74.6
Inert Components	
Inert Semi-fusinite (1/2) %	13.9
Micrinite %	2.2
Fusinite %	5.1
Mineral Matter %	4.2
Total %	25.4
Petrographic Indices	
Mean Reflectance %	1.60
Balance Index	3.61
Strength Index	7.16
Stability Index	53.0

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, 1 dd/m; fusion, 55 dd/m; final, 1dd/m; solidification, no movement; range-temp., between start and final temperatures).

4. Burrough, E. J. "Specific Volatile Index"; Fuel Division Memorandum 97/58-CG; Fuels and Mining Practice Division, Mines Branch, Department of M and TS; Ottawa, Canada

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

6. ASTM Designaion; D2797-72; "Preparing Coal Samples for Microscopical Analysis by Reflected Light".

7. ASTN 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 Pysical Components of Coal".

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

APPENDIX 1

Letter dated 8 December 1981 from

E. Parsons, Manager, Coke Ovens Department

Sydney Steel Corporation, Sydney, Nova Scotia

SYDNEY STEEL CORPORATION

Head Office and Sales

Sydney, Nova Scotia, Canada
P.O. Box 1450, B1P 6K5
Tel. Area (902) 564-5471
Telex CN-CP 019-35197
Cable Address: "SYSTCO"

Coke Ovens Department,
Dec. 8,1981

Mr. B. I. Parsons,
Director,
Energy Research Laboratories,
555 Booth Street,
Ottawa, Canada

Re: Testing of a Sample of Smoky River Low Volatile Coal

Dear Mr. Parsons:

A sample of the above mentioned coal is being sent to your J. G. Jorgensen for "Oxidation Tests". We have had considerable trouble recently with bulk density control in our Blending Plant. All other avenues have been researched, without success, so it is felt there could be some oxidation in the Smoky River Coal which would cause the Blending Oil to be rather useless for bulk density control.

Trusting that this letter will get the project underway. Your co-operation will be greatly appreciated.

Yours very truly,

Eric Parsons,
Manager

EP:lm