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CANADA CENTRE FOR MINERAL AND ENERGY TECHNOLOGY
(Former Mines Branch)

THE VULNERABILITY TO EXPLOSION OF TWO DUST SAMPLES FROM ELKVIEW COAL PREPARATION PLANT - KAISER RESOURCES SPARWOOD, BRITISH COLUMBIA (JOB 4028)

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This report relates essentially to the samples as received.

REPORT ERP/ERL 75-61 (TR)

The Vulnerability to Explosion of Two Dust Samples from Elkview Coal Preparation Plant - Kaiser Resources Sparwood, British Columbia (Job 4028)

INTRODUCTION

At the request of D.P. Sharma, Quality Control Supervisor, Kaiser Resources Limited, test work was carried out on two samples of dust collected at the Elkview Coal Preparation Plant.

Two samples weighing approximately 2 lbs. each, contained in plastic bags, were received March 8, 1975. The samples were designated as from "Top of Clean Coal Silo" and subsequently numbered 2650-75, and "Top of Raw Coal Silo" and subsequently numbered 2651-75.

EXPERIMENTAL

The samples referred to above were air dried and screened, see Table I, Screen Analysis.

Proximate analysis, sulphur and calorific values were carried out on the -400 sieve material, see Table II.

TABLE 1

Screen Analysis

Sample No.	2650-75	2651-75
Description	Top Clean Coal Silo	Top Raw Coal Silo
Sieve Size (Canadian Standard)	%	%
+ 1/4"	1.34	0.26
1/4" x No. 6	1.32	0.25
No. 6 x No. 12	1.14	0.20
No. 12 x No. 20	0.75	0.18
No. 20 x No. 60	1.12	0.49
No. 60 x No. 100	0.70	2.09
No. 100 x No. 200	6.66	13.21
No. 200 x No. 325	32.13	17.58
No. 325 x No. 400	10.03	26.04
- No. 400 x 0	44.81	39.70

TABLE II

Analysis of -400 Sieve Samples

Sample No.	2650-75			2651-75		
Description	Top, Clean Coal Silo			Top, Raw Coal Silo		
Proximate Analysis	As Rec'd.	Dry	Mmf	As Rec'd.	Dry	Mmf
Moisture %	0.60	0.00		0.57	0.00	
Ash %	9.80	9.86		11.43	11.50	
Volatile Matter %	19.11	19.23	19.32	20.70	20.82	22.51
Fixed Carbon %	70.49	70.91	80.68	67.30	67.68	77.49
Sulphur	0.21	0.21		0.13	0.13	
Calorific Value Btu/lb gross	13960	14040		13560	13640	
Volatile Ratio (as rec'd.) $\frac{V}{V+FC}$	0.213			0.234		
Minimum Ignition Temp °C (actual tests av. of 5)		610°C			620°C	

CONCLUSIONS

As some of the explosibility test equipment is no longer in use, it was necessary to use analytical data to predict the behaviour of the dusts based on U.S. Bureau of Mines Report of Investigations 5052, "Laboratory Explosibility Study of American Coals". Minimum ignition temperatures were determined.

Ignition Temperature: (-400 Sieve Dust)

The Dry Mineral Matter Free Volatile Matter for Sample 2650-75 and 2651-75 is 19.3 and 22.5% respectively. Dust clouds of coals of this rank would not be susceptible to ignition in air at temperatures below 600°C; a layer of dust on the other hand could ignite at slightly above 200°C. By test the values were found to be 610°C and 620°C respectively.

Minimum Ignition Energy: (-400 Sieve Dust)

On the same basis as above dust clouds of these samples would require a spark with energy in excess of 200 millijoules.

Minimum Explosive Concentration: (-400 Sieve Dust)

On the same basis as above concentrations in excess of 1.0 oz. per cu. ft. would be required for ignition to occur with an open flame or hot electric spark.

Explosion Sensitivity Related to Particle Size

Mine size dusts are considered to be material passing a No. 20 Sieve. The samples in question are 95.45% and 99.11% through a No. 20 Sieve with 44.81% and 39.70% passing a No. 400 Sieve. If these samples were dry and became suddenly dispersed and a sufficiently strong source of ignition were present, an explosion would occur. The fine size of the material would more than overcome the low volatility with respect to explosive sensitivity.

It would be advisable to prevent dust accumulation by continuous removal or inerting with rock-dust or water. The inert content of these dusts is 10.40% and 12.00% respectively, far below the provincial requirement of 50% in underground mines. It is realized however that the tops of the silos from which the samples were taken are above ground but probably enclosed in a building, creating a similar environment to that found underground. An effort should be made however to take steps to prevent dust accumulation by sealing off areas where dust originates prior to settling on top of the silos.