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FUEL RESEARCH INSTITUTE OF SOUTH AFRICA.

TECHNICAL MEMORANDUM NO. 23 OF 1963.

RESEARCH ON FLOTATION OF COAL

by

P.C. DAVIS.

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FLOTATION OF WATERBERG COAL - NO. 3 SEAM

A preliminary report on the flotation of coal in a miniature glass flotation cell was completed, and as great difficulty was experienced in the flotation of Waterberg Coal - No. 3 seam at the pilot plant, it was decided to investigate the flotation of this coal in a laboratory Denver cell, capacity 500 g.

According to previous reports on froth flotation experiments which had been done at the Institute, an unknown quantity of extra air had always been supplied to the cell. The air flow through the cell was, therefore, measured for various tachometer readings and from the results obtained it was decided to use an impeller speed of 1500 r.p.m. with no addition of extra air.

In the meantime a new Denver flotation machine was acquired; the air flow of this machine was compared with that of the old one and was found to be practically the same. The new machine was used in all subsequent experiments.

The flotation of a large sample (70 lbs) of Waterberg No. 3 seam coal, obtained from the pilot plant, was investigated. A wet screen analysis of a sample showed that ca. 29% of the coal had a particle size of less than 200 B.S.S. mesh. During the flotation of this coal at the pilot plant the product was mostly very fine material, and in preliminary experiments in the laboratory cell the same was observed. The influence of various amounts of paraffin and M.I.B.C. on the yield and ash content of the products was, therefore, investigated.

500 g samples of coal, taken at random from the large sample, were stored under water in bottles. A whole range of experiments was done, but it was found to be practically impossible to get duplicate results of yields. The products and discards were dried in an oven; the filter cakes were broken up and mixed thoroughly. Representative samples were analysed for ash content, but again it was found difficult to obtain duplicate results. It was, therefore, decided that instead of abstracting 500 g samples from the large sample, representative samples should be cut out by machine. It was further decided to grind the products and discards to -60

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flotation reagent requires further investigation. The use of Berol EMU-26 as an emulsifier and depressant will also be investigated.

INFLUENCE OF IMPELLER SPEED:

The influence of impeller speed on product yield and ash content was investigated. Increasing the speed of the impeller causes increased agitation of the suspension as well as an increase in the flow of air. If the impeller speed is very high, it may happen that material which should appear in the discard is forced into the froth and held therein, with a resulting increase in yield and ash content of the product. Table III gives the results obtained in the laboratory cell on - 1 mm. Waterberg No. 3 seam coal by varying the impeller speed from 900 r.p.m. to 1800 r.p.m. The product yield increased from ca. 34 per cent at 900 r.p.m. to ca. 65 per cent at 1600 r.p.m., with a corresponding increase in ash content. From 1600 r.p.m. to 1800 r.p.m. the yields and ash contents remain practically constant.

METHOD OF CONDITIONING

Work on the influence of various methods of conditioning has been initiated.

(signed) P.C. DAVIS
Senior Technical Officer.

TABLE I.
EFFECTS OF VARIATIONS IN PARTICLE SIZE OF THE FEED ON THE FLOTATION OF WATERBERG NO. 3 - SEAM COAL.

Particle Size B.S.S. mesh	% Ash Feed	Paraffin lb/ton	M.I.B.C. lb/ton	Tall Oil lb/ton	Impeller Speed r.p.m.	% Ash Product	% Ash Discard	% Yield	% Yield Calculated
200	26.2	7.74	0.1	-	1500	14.2	31.4	31.0	30.2
"	"	"	"	-	"	14.9	31.4	33.1	31.5
"	"	-	-	7.74	"	22.0	51.9	87.4	86.0
-120	21.7	7.74	0.1	-	1500	14.6	25.9	35.9	37.2
"	"	"	"	-	"	14.7	26.3	38.8	39.7
"	"	-	-	7.74	"	19.1	45.0	90.8	90.0
"	19.1	-	-	7.74	"	18.8	24.9	97.7	95.0
-60	18.7	7.74	0.1	-	1500	14.4	23.5	54.2	52.7
"	"	"	"	-	"	14.5	23.7	54.5	54.3
"	"	-	-	7.74	"	17.2	32.8	90.4	90.4
"	"	-	-	3.8	"	15.8	26.9	75.7	73.9
+60	17.8	7.74	0.1	-	1500	12.8	22.4	53.0	49.0
"	"	"	"	-	"	12.3	23.6	50.7	51.3
"	"	-	-	7.74	"	13.5	25.0	63.2	62.6
"	"	-	-	3.8	"	13.3	22.3	51.3	50.0

TABLE II.

EFFECTS OF THE USE OF VARIOUS FLOTATION REAGENTS ON THE FLOTATION OF THE
 -60 + 120 B.S.S. MESH SIZE FRACTION OF WATERBERG NO. 3 - SEAM COAL.

% Ash Feed	Paraffin lb/ton	M.I.B.C. lb/ton	Tall Oil lb/ton	BE - 26 lb/ton	Impeller Speed r.p.m.	% Ash Product	% Ash Discard	% Yield	% Yield Calculated
18.7	7.74	0.1	-	-	1500	14.4	23.5	54.2	52.7
"	7.74	-	-	0.1	"	12.8	20.5	21.9	23.4
"	-	0.1	7.74	-	"	17.4	37.3	93.0	93.5
"	-	-	7.74	0.1	"	16.8	36.0	91.1	90.1
"	-	-	7.74	-	"	17.2	32.8	90.4	90.4
"	-	-	3.8	-	"	15.8	26.9	75.7	73.9

TABLE III.

INFLUENCE OF IMPELLER SPEED ON THE
FLOTATION OF WATERBERG NO. 3 - SEAM COAL.

Impeller Speed. r.p.m.	Ash Content of Feed } 18.4%		-1 mm. material	
	% Ash Product	% Ash Discard	% Yield	% Yield calculated
900	11.7	21.6	34.0	32.3
1100	12.2	22.8	43.8	41.5
1300	13.4	23.3	52.2	49.5
1500	13.7	24.5	59.9	55.0
1600	14.4	26.0	65.9	65.5
1700	14.5	25.1	68.7	63.2
1800	14.6	26.4	69.9	67.8