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FUEL RESEARCH INSTITUTE OF SOUTH AFRICA.

TECHNICAL MEMORANDUM NO. 27 of 1963.

SHOCK AND GRADUAL HEATING OF COAL.

by

G.S. VAN EEDEN.

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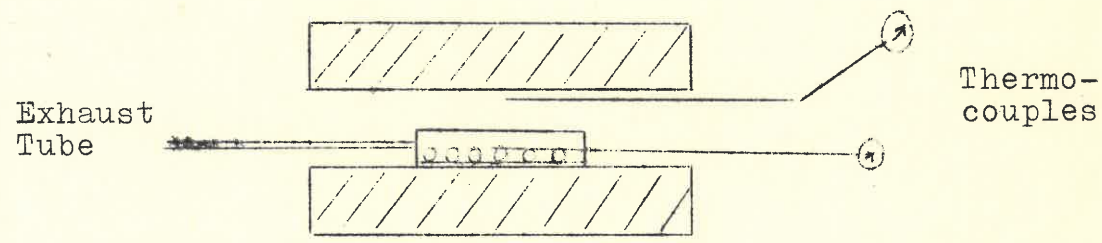
PROGRESS REPORT ON SHOCK AND GRADUAL HEATING OF COAL.

With a view to the production of smokeless fuels, tests were conducted to determine the rate at which coal particles can be heated without disintegrating.

Nut size coal from Van Dyksdrift of 29.4% V.M. and 15% ash content was used.



The apparatus used consisted of an oven with suitable temperature range (1000°C) with a thermocouple for temperature observations. The coal sample container was a tin of suitable dimensions to fit the oven opening. Due to the combustion of escaping gases at high temperatures, which hampered the temperature control, an exhaust tube was added to the container. A second thermocouple, inserted in the sample container, provided accurate indications of temperature changes.

The procedure applied was as follows: A 100 gm. sample in the tin container was placed in the oven under the following conditions:

a) Shock treatment: oven previously heated to desired temperature before inserting sample. Various samples were treated for different time intervals.

b) Gradual heating: sample placed in oven while cold and temperature gradually increased to desired temperature, after which the sample was removed and weighed. Different samples were kept in the oven at this temperature for various periods.

According to the results obtained, the most suitable conditions for a V.M. loss of approximately 10 to 15% appear to be the gradual heating of a coal sample to 600°C, with a residence time at 600°C of 5 minutes, the

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duration of the complete treatment being approximately 20 minutes.

The results obtained are tabulated below.

Treatment	Appearance	Volatile Matter Loss %	Residual V.M. of char (approx) %
Shock Treatment			
1) 1000°C 15 min.	Badly cracked. Disintegrates.	22.5	9
2) 800°C 15 min.	Badly cracked. Disintegrates.	26.0	3
3) 800°C 6 min.	Cracked. Less. Disintegration.	13.0	18
Gradually Heated			
4) 100 - 800°C 18 min.	Slightly cracked. Some caking of particles.	28.1	2
5) 140 - 600°C 9 min.	No caking. Cracking. Some disintegration.	3.2	26
7) 200 - 600°C 14 min. + 5 min. at 600°C	No caking. Some cracking.	19.5	12
8) 160 - 600°C 13 min. + 10 min. at 600°C	No caking. Some cracking.	24.7	6
6) 100 - 700°C 19 min.	Some caking. Cracks.	20.1	11
Tin & Exhaust Tube			
9) 100 - 600°C 14 min.	No caking. Some cracks.	11.2	20
10) 160 - 600°C 10 min. + 5 min. at 600°C	No caking. Some cracks.	14.9	17
12) 20 - 600°C 15 min. + 10 min. at 600°C	Caking. Some cracks.	26.1	4
13) 100 - 600°C 14 min. + 5 min. at 600°C (Thermocouple in sample).	Slight caking. Some cracks.	17.8	14

(signed) G.S. van Eeden.
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