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FUEL RESEARCH INSTITUTE OF SOUTH AFRICA.

TECHNICAL MEMORANDUM NO. 35 OF 1965.

(AN INTRIM REPORT)

# IGNITION OF COAL DUST.


By:

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## INTRODUCTION:

This report contains preliminary results of tests carried out to determine the ignitability of coal dusts. The investigation was limited to experiments done in a Godbert-Greenwald furnace (which is used to determine the minimum ignition temperature of coal dust) made in the Institute's workshop to sketches available in reports. No working drawings were available at the time.

The investigation was planned to serve as orientation and to gain experience with the test procedure. Insufficient determinations were carried out to enable definite conclusions to be drawn as to the flammability of South African coal dusts. No attempt was made to investigate the effect of sample preparation, moisture content and dust concentration on the measured ignition temperature. The results must be regarded to be tentative only.

## TEST PROCEDURE:

A quantity of minus 200 mesh (B.S.) coal dust is dispersed downward into a vertically mounted tubular electric furnace by a blast of air.

The optimum quantity of dust was found to be ca. 0.1 g. A lesser quantity tends to ignite at a higher temperature, whereas more than 0.1 g of dust "overloads" the furnace and does not ignite, probably due to an oxygen deficiency.

The temperature of the oven is regulated to within $2^{\circ}C$ and is increased by increments of $5^{\circ}C$. between tests.

Four .../

Four determinations per sample are carried out at each specific temperature.

The temperature at which a flame appears in or at the mouth of the furnace for at least one of the four determinations is reported as the minimum ignition temperature of the dust sample.

The results of tests carried out on 25 coal samples chosen to represent the major coal-fields of South Africa are given in Table 1. Four British coals were included for the sake of comparison. In Figure 1 the coal dust ignition temperature is plotted as a function of volatile matter content (air-dry basis).

The ignition temperature of the anthracitic coals is indeterminate and values are not reported for such coals. The ignition temperatures of the bituminous coals on the other hand are manifested by the appearance of a definite flame in or at the mouth of the furnace.

Artificial dusts were prepared by grinding representative coal samples to pass through a 200 mesh (B.S.) sieve. Due to the preferential breakage of the more brittle coal components, it is possible that there is a difference between dust produced artificially and dust which occurs in mines as a result of coal-getting.

Reference to Table 1 shows that the ignition temperatures of the various coals do not differ very much, However, Figure 1 indicates that there may be a relation between the volatile matter content of the coal and its ignition temperature. Apparent differences between Natal and Transvaal coals are also indicated by this figure.

The following observations regarding the appearance of the flame in the test apparatus are of interest. As the ignition temperature of a particular coal is approached, the formation of dense brown smoke is apparent. The smoke being more dense in the case of the coals of higher volatile matter content. When the ignition temperature is reached, it is the ignited smoke which apparently produces the flame, a residue of charred coal is obtained in all experiments.

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PRETORIA.
11/8/65.

TABLE 1.

| Colliery | Coal-field | Moisture content % | Ash content % | Volatile matter content (air dry basis) | Ignition temperature °C |
|---|---|---|---|---|---|
| Albion | Witbank | 2.2 | 13.7 | 26.9 | 640 |
| Brakfontein | Witbank | 3.7 | 13.8 | 28.6 | 640 |
| Kendal | Witbank | 3.3 | 14.3 | 31.3 | 630 |
| New Largo | Witbank | 3.1 | 22.2 | 24.1 | 650 |
| Springbok No. 2 | Middelburg | 2.3 | 11.2 | 27.8 | 640 |
| Springbok No. 5 | Middelburg | 2.3 | 9.9 | 32.7 | 625 |
| Bellevue | Ermelo | 3.5 | 13.8 | 31.6 | 635 |
| Union | Ermelo | 2.4 | 17.3 | 29.3 | 640 |
| Springfield N. | Heidelberg | 5.3 | 17.7 | 26.4 | 645 |
| Springfield S. | Heidelberg | 5.3 | 20.7 | 23.2 | 655 |
| Coalbrook No. 2 | O.F.S. | 4.0 | 25.6 | 21.4 | 650 |
| Bertha No. 1 | O.F.S. | 5.7 | 26.4 | 24.0 | 620 |
| Bertha No. 2 | O.F.S. | 5.7 | 21.8 | 28.2 | 630 |
| Vierfontein | O.F.S. | 6.2 | 24.2 | 22.2 | 665 |
| Sigma | O.F.S. | 6.2 | 25.7 | 23.1 | 630 |
| Amajuba Anthracite | Natal | 1.8 | 27.4 | 8.9 | - |
| Brockwell Anthracite | Natal | 1.9 | 10.6 | 9.9 | - |
| Elandsberg Anthracite | Natal | 2.6 | 10.6 | 4.2 | - |
| Jackson's Anthracite | Natal | 1.7 | 10.2 | 6.5 | - |
| Ballengeich | Natal | 1.7 | 17.0 | 28.7 | 630 |
| D.N.C. | Natal | 1.1 | 12.2 | 30.3 | 625 |
| Hlobane | Natal | 1.0 | 18.4 | 19.9 | 645 |
| Kilbarchan | Natal | 1.5 | 21.3 | 23.7 | 640 |
| Utrecht | Natal | 1.6 | 18.0 | 25.6 | 635 |
| Enyati | Natal | 1.2 | 22.8 | 17.4 | 640 |
| Silkstone | British coals | 1.2 | 3.4 | 34.5 | 635 |
| Anthracite: class 101 | British coals | 1.1 | 2.5 | 6.1 | - |
| Steam coal: class 204 | British coals | 0.7 | 6.5 | 16.9 | 635 |
| Brockwell seam | British coals | 0.8 | 7.1 | 23.9 | 635 |

# IGNITION TEMPERATURES (GODBERT–GREENWALD) AS A FUNCTION OF VOLATILE MATTER CONTENT

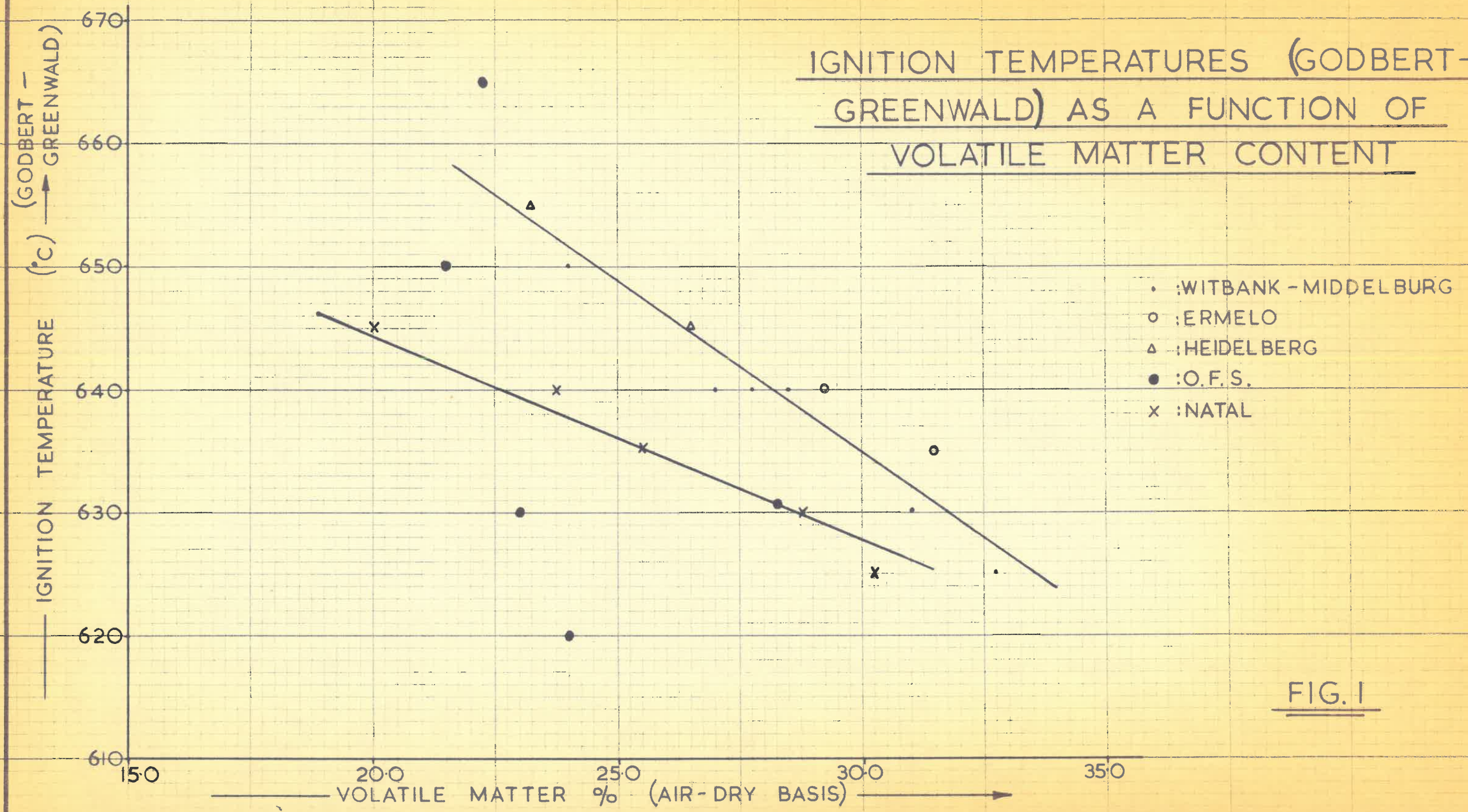


FIG. 1