FUEL RESEARCH INSTITUTE OF SOUTH AFRICA.

TECHNICAL MEMORANDUM NO. 19 OF 1963.

# TEST REPORT ON "SOLAR" STOVE.

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The "Solar" stove is designed to burn wood waste and similar materials. The appliance was tested at the request of the makers, Messrs. Genda and Takacs, in the Appliance Test Laboratory of the Fuel Research Institute on April 29th and 30th, 1963.

The test procedure adopted for this stove was as follows:

The fuel container was loaded with wood waste in accordance with the makers' instructions, the quantity of fuel used being weighed. The fire was kindled by means of a small quantity of sawdust soaked in paraffin. When it was clear that the fire was properly lighted, the draught, measured at the base of the chimney, was kept at a constant figure and a vessel containing 2 kg of water of 25°C placed on the hot plate. The time required to raise this water to boiling point (95.6°C) is designated as the heating up period.

Thereafter, cooking vessels with water of 25°C were periodically placed on the hot plate and the quantity of heat absorbed by the water in a period of one hour was determined. The portion of the hot plate covered was between 50 and 60% of the total hot plate area.

Hot plate and stack temperatures were measured by means of thermocouples and recorded.

In order to assess smoke evolution, the light absorption of the flue gas was measured photo-electrically. The amount of fuel consumed was determined by placing the stove on an automatically operated scale so that the weight lost could be continuously recorded, corrections for weight losses due to evaporation of water from the cooking vessels being applied.

TEST RESULTS:

No difficulties were experienced in lighting the fire or keeping this burning. Some visible smoke is produced immediately after lighting up. Since the smoke is of a light bluish colour, no assessment by means of Ringelman numbers was attempted. It may be mentioned, however, that for smoke from a coal fire, the 40% light absorption point roughly

corresponds/...

corresponds to the shade Ringelman No. 2, while a 10% absorption cannot be noticed visually. With the present apparatus, the maximum value of light absorption observed was 23%, and this only for a few minutes.

Initially, the volatile matter of the fuel is driven off, after 3 to 4 hours, this process is completed and most of the fuel converted into a mass of porous and very reactive char which readily absorbs the oxygen of the combustion air. Very high figures for the carbon dioxide and carbon monoxide content are observed at this stage and it is necessary to control the rate of air admission carefully as otherwise unduly high temperatures are attained.

This phase ends when most of the fuel has been consumed, though after this stage a slow combustion process still continues for several hours. The fuel is almost completely consumed, the residue at the end of the test being of the order of 3% of the original fuel weight.

Quantitative data concerning the test are summarised in attached table and diagrams.

TABLE NO. 1.

Summarised Data of Tests in "Solar" Stove on 29th and 30th April, 1963.

DIMENSIONS OF STOVE: Height 25¾ in. Length 17¼ in. Width 17¼ in.

HOT PLATE AREA: (nett) 219.2 in.$^2$

(nett Hot Plate Area denotes that portion of the hot plate immediately exposed to the radiant heat from the fire).

FUEL: Wood waste (sawdust and small chips).

Calorific value (gross) 7880 B.Th.U./lb. (4380 kcal/kg.).

Ash 0.3%. Moisture 8.2%. Volatile Matter 87.8%.

| TEST DATA | | TEST III | TEST IV |
|---|---|---|---|
| Draught | mm. water | 1 | 0.5 |
| Quantity of fuel loaded, | lb. | 17 | 17 |
| Quantity unburnt at end of test | lb. | 0.7 | 0.61 |
| Duration of burning period | | 8h.55 min. | 8h.40 min. |
| Smoke (light adsorption) peak | % | 23 | 16:5 |
| Heating up time | min. | 26 | 21 |
| Heat absorbed by water in cooking vessels | B.Th.U./h. | | |
| 1st test hour | | 2580 | 1810 |
| 2nd test hour | | 4440 | 1910 |
| Fuel burnt: | lb. | | |
| 1st test hour | | 3.20 | 2.26 |
| 2nd test hour | | 5.30 | 2.14 |

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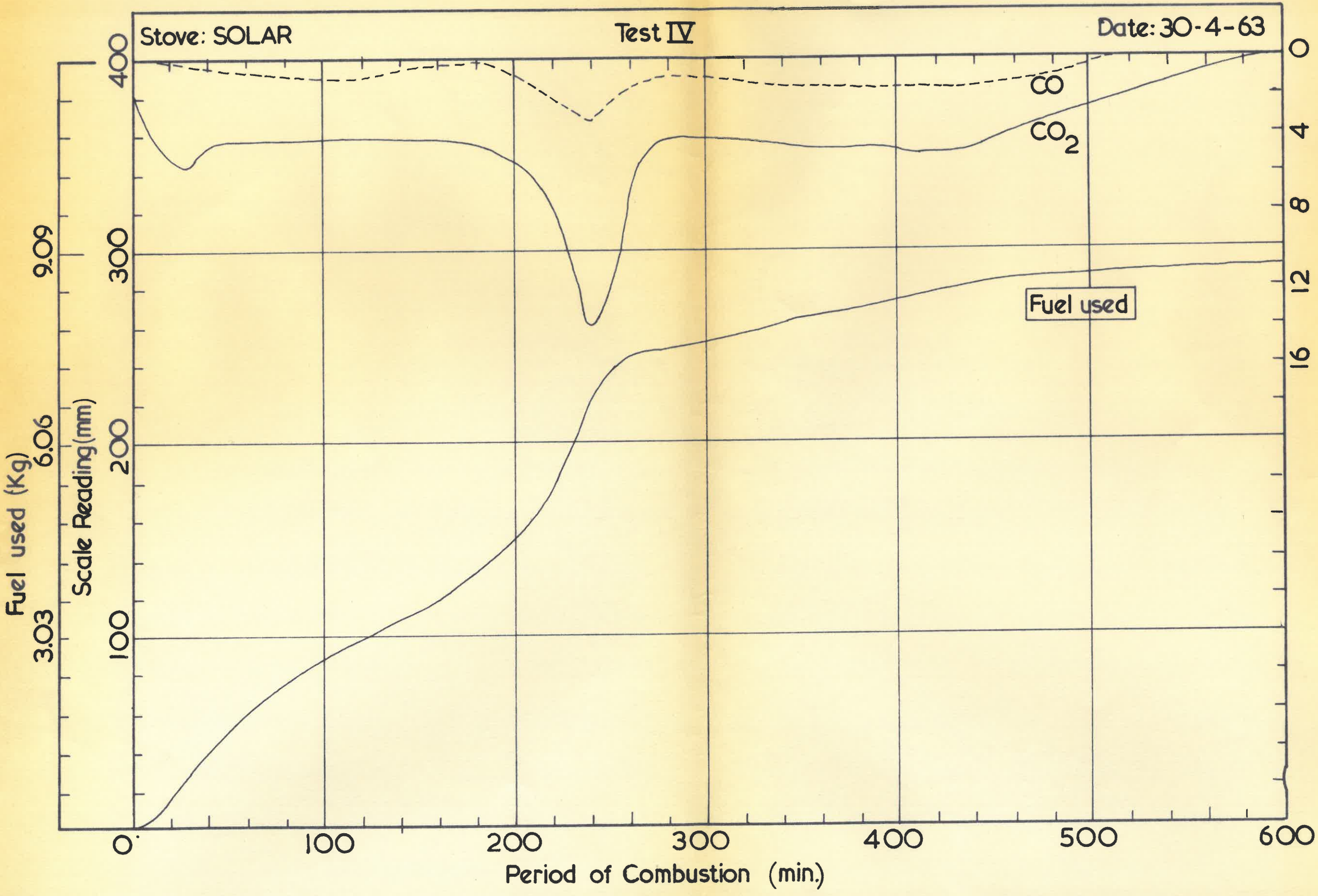
Stove: SOLAR

Test IV

Date: 30-4-63



Stove : SOLAR

Test: IV

Date: 29-4-63

56.07 % COVER

50.35 % COVER

Ringelmann I

Stack

Hotplate

Smoke Density

Temperature (°C)

Smoke Density (%)

Period of Combustion (min.)

0 100 200 300 400 500 600

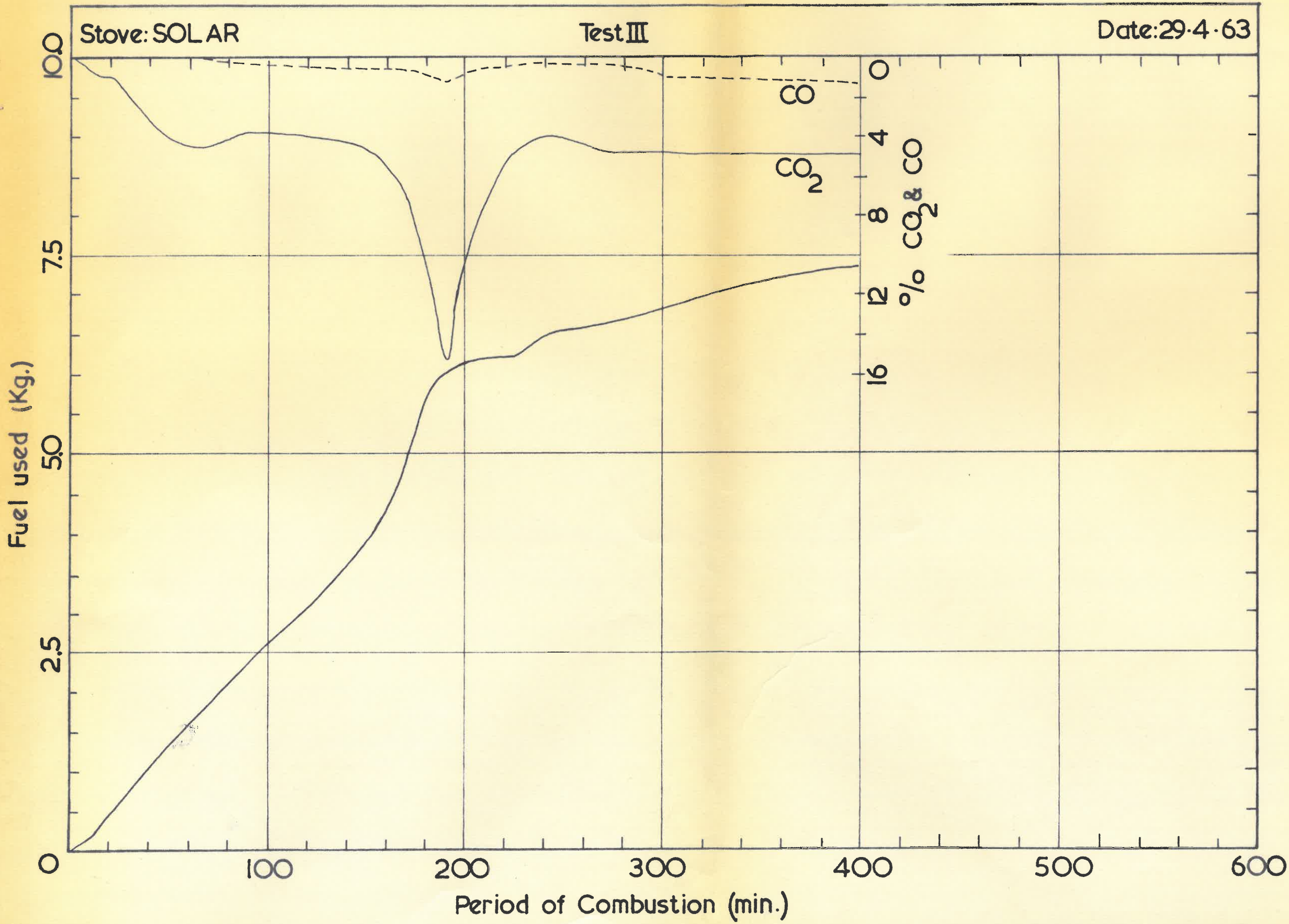
100 200 300 400

10 20 30

Stove: SOLAR

Test III

Date: 29·4·63



Stove: SOLAR

Test. III

Date: 29 - 4 - 63

Temperature (°C)

Smoke Density %

Period of Combustion (min.)

50.35% Cover

56.07% Cover

Ringelmann II

Stack

Hotplate

Smoke Density