UTILIZATION OF SOUTH ARCOT LIGNITE CHAR AS DOMESTIC FUEL

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THIS paper summarises the results of an investigation carried out on the use of South Arcot lignite char as domestic fuel. The development of a suitable and reasonably economic substitute for charcoal from South Arcot lignite[1] will go a long way in easing the domestic fuel situation, preventing cutting down of forests for domestic fuel supplies and finding better utilization for cow dung.

The char obtained by the carbonization of air-dried South Arcot lignite at about 500° C. in a locally designed and fabricated carbonizer, which can treat about 80 lb. of lignite at a time, was used in these tests. For the first series of five tests, the char was obtained from lignite from borehole number 161. In this case, 45 lb. of this material was carbonized at 510° C. In the second series of five tests, the char was from lignite sample from several boreholes and pit number 3 carbonized at 520° C. The charcoal available locally was used in the third series of tests.

Every test consisted of preparing boiled rice as per local household practice from weighed amounts of water, rice and fuel. About 200 g. of fuel were weighed and equal quantities of rice and water were used in all tests. The same household hearth (open fireplace) was used in all the experiments.

A weighed amount of fuel was first placed on the grate, and ignited by a torch prepared from a small amount of coconut fibre dipped in kerosene. The fuel was allowed to catch fire and when the cooking was over, the rice vessel was removed from the hearth and the residual fuel was put in a closed container for cooling Its weight was determined after cooling. The proximate analysis, calorific value and sulphur content of the samples of char and charcoal and the proximate analysis of the residual material were determined.

Table I gives the analysis (before and after use) of lignite char and charcoal used in the three series of tests, and also the actual consumption of the fuel. It shows that the volatile matter and ash contents of the lignite char are in line with those in charcoal, but the sulphur content in the former is more. The fuel consumption was calculated on moisture and ash-free basis.

TABLE I

Comparison of lignite char and charcoal as domestic fuel

Material used		Series I 1–5 Expts. Lignite Char*	Series II 6–10 Expts. Lignite Char†	Series III 11–15 Expts. Charcoal
BEFORE USE—				
Moisture %	..	6·83	7·78	4·54
Ash %	..	6·06	7·07	4·54
Volatile matter %	..	7·62	10·57	13·01
Fixed carbon %	..	79·49	74·58	77·91
Calorific value B.T.U./lb.	..	12,090	11,770	12·780
Sulphur %	..	0·52	0·49	0·18
AFTER USE—				
Moisture %	..	8·94 to 10·00	8·84 to 9·73	7·27 to 8·70
Ash %	..	7·32 to 10·60	8·10 to 11·78	6·00 to 8·30
Volatile matter %	..	7·08 to 8·89	6·74 to 10·35	8·32 to 10·49
Fixed carbon %	..	71·57 to 75·95	68·03 to 79·76	74·74 to 77·57
Calorific value B.T.U./lb.	..	10,950 to 11,160	9,640 to 11,280	11,050 to 11,660
Sulphur %	..	0·62	0·63	0·19
Weight of material before use g. (moisture and ash-free)		244·1	170·3	254·8
Weight of material after use g. (moisture and ash-free)		151·4 to 166·9	87·3 to 97·8	129·9 to 150·3
Consumption of fuel g	..	72·2 to 92·7	72·5 to 83·0	104·50 to 124·9
Average consumption g.	..	84·8	79·8	118·9

* Lignite from several boreholes and pit No. 3 (pilot pit from which about 60 tons of lignite was raised).
† Lignite from borehole No. 161 (one of the boreholes dug for proving lignite bed).

TABLE II

Details of experiments

Experiments	Material	Weight of fuel g.	Weight of residue g.	Ignition time min.	Total time min.	Weight of rice g.	Weight of water g.
I series, 1 to 5	Lignite Char*	280·2	185·3 to 200·6	6 to 9	33 to 35	350·3	840·7
II series, 6 to 10	Lignite Char†	200·0	105·45 to 119·3	7 to 8	31 to 34	363·8	1000·0
III series, 11 to 15	Charcoal	280·2	151·6 to 173·6	4 to 5	28 to 34	350·3	840·7

* Lignite from borehole No. 161. † Lignite from several boreholes and pit No. 3.

Table II gives the data with regard to the details of the experiment.

These data indicated that the consumption of fuel was lower, when lignite char was used. The average fuel consumption in the first series was 84·8 g. for the charge of rice and water used, in the second series 79·8 g., and in the third series (when charcoal was used) 118·9 g. On the whole, lignite char consumption was 28·7% less than charcoal. The lower consumption of lignite char is in line with what was found by Ratnam *et al.*[2] in its utilisation as bus fuel. The per cent. reduction is about the same in both cases and the calorific value of the fuel is not a factor in fuel consumption in this case, as can be seen from the fact that charcoal has greater calorific value than the two lignite chars used. The nature and the burning qualities seem to be controlling factors here. Studies on this are under way.

The ignition time in the case of lignite char was generally 3 to 4 minutes longer than when charcoal was used, but the total time taken for the entire cooking operation was about the same in both cases. Hence, no ultimate delay was involved in using lignite char as domestic fuel. Although the sulphur content in lignited char was higher than in charcoal, it was still low and in actual practice did not cause any inconvenience. As these tests were carried out in a kitchen using an open hearth in daily use, these observations will apply to the conditions that are likely to prevail in most houses in S. India.

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1. Ratnam, C. V. S., *Madras Information*, August 1953, 44.
2. —, Ramanathan, V. S. and Veeraraghavan, S., *J. Sci. Ind. Res.*, 1955, **14 B**, 604.

BHILAI STEEL PROJECT

THE Government of India have accepted the detailed Project Report for the Bhilai Steel Works, furnished by the Soviet authorities. The proposed plant will consist of three blast furnaces for producing iron. By the use of high top pressure and sintering of iron ore, the output of the blast furnaces will be increased significantly. Steel will be produced by the straight basic open-hearth process in six open-hearth furnaces. Ingots produced will be 6-7 tons in weight. The large 1,150 mm. blooming mill will be capable of handling 10-ton ingots. The rolling mills are of modern design and layout, and incorporate technological improvements well proved in the U.S.S.R. The capacity of the plant will be, besides 300,000 tons of pig iron, 1 million tons of ingots yielding about 770,000 tons of rails, heavy and medium structurals, light structurals, sleeper bars and billets. With slight additions to the plant, such as an additional open hearth and a group of soaking pits, its capacity can be raised at any time to 1·3 million tons of ingots. No further additions of rolling mills will be required to finish the additional ingots. Apart from this, the plant will be so laid out that it can be expanded to produce up to 2·5 million tons of ingots.

The steel works are expected to achieve full production by December 1959, but two coke oven batteries, two blast furnaces, two open-hearth furnaces and the blooming mill will be commissioned about a year earlier.