DOMESTIC COKE.

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As a result of the recommendation of the Noyce Committee the Coal Grading Board was established by the India Government for grading coal. A few years later the Soft Coke Cess Committee was formed and the Act No. VIII of 1929 provided for the levy of a cess of two annas per ton on soft coke despatched by rail from collieries in the provinces of Bengal, Bihar and Orissa. The purpose for which the cess was levied was two-fold, namely (i) for promoting the sale, and (ii) for improving the method of manufacture of soft coke. The realisation of this cess has been going on for the last ten years and the fund thus accumulated is disbursed according to the scheme of expenditure formulated by the Soft Coke Cess Committee. In the following pages an attempt is made to show how far the objects for which the cess was levied has been fulfilled.

A perusal of the balance sheet published by the Soft Coke Cess Committee will show that practically all the money, *i.e.* nearly one lac of rupees, is spent for propaganda work in order to popularise the soft coke amongst the general public throughout India. For the second object a sum of Rs.2,400 only was spent by the committee.

A reference to the report will show that continuous propaganda has been carried out for popularising the soft coke and the detailed method of such work is quoted below:

> 'The committee's staff made house to house visits in every centre and explained to householders the advantages, economic and hygienic, of soft coke over other fuels. Practical demonstrations in lighting soft coke were also given whenever required. Soft coke and portable ovens were distributed free at all propaganda centres.' . . . . 'The lady officers of the committee worked amongst the womenfolk with great success. The staff rendered all possible help to consumers in obtaining their supplies of soft coke. Certain staff was also sent to outstations to carry on propaganda work.' . . . . . 'The committee's publicity work was carried on through newspaper advertisements, distribution of handbills and leaflets.' . . . . 'Pictorial posters were displayed at all propaganda centres and other towns.' 'Enamel signs were exhibited at important stations on all the principal railways. The committee's films were shown free to the public.' . . . . . 'Sandwich boys carrying posters and literature on soft coke paraded on suitable occasions.' 'The committee issued a calendar for the year 1938' and also for 1939.

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This speaks well of the energetic effort of the committee to push the sale of soft coke but I do not understand why the committee failed to realise that the commodity for which they are trying so much should also be improved in quality so that their efforts in popularising it might meet with success in a more easy manner. They do not seem to have exerted much of their energy in this direction. The consumers have been paying the cess for these years under the expectation that they would get a better commodity in return for the extra money spent, but ten years have elapsed without bringing about any change or improvement in the quality of soft coke and at the present day the same old material prepared by the same old process from the inferior grade and stony coals is placed on the market for which so much propaganda is carried out. Sufficient length of time (ten years) has already elapsed, and if the method of manufacture of soft coke is not going to be improved and if a better quality smokeless fuel is not going to be placed on the market I do not see any reason why brisk agitation should not be started and why the India Government should not be moved to reduce the cess to a minimum or to stop it. I am personally of the opinion that the first and foremost duty of the Soft Coke Cess Committee should have been to improve the coke in quality and then to carry the propaganda work for pushing its sale. A reference to the report will show that the committee found their way to sanction the grant of a bonus on the sale of soft coke to depot-holders in Bombay but I think the committee would have acted more wisely if they awarded a bonus to the manufacturers of soft coke for producing a better smokeless fuel. By this move the owners of coal mines would have taken the initiative to devise ways and means to improve the method of preparing soft coke. Another suggestion is that the committee should make arrangement to check from time to time the quality of coke produced at different places and class them in different grades of quality and market prices. The committee should give more attention to this aspect of the question and it is rather unfortunate that during the last ten years nothing has been achieved in this direction.

Method of Manufacture.

A reference to the report shows that after ten years the committee realised that 'there is also room for improvement in the process of manufacture' and with a view to ascertaining how a better quality coke can be obtained the committee solicited the help of the '*Research Department of the Indian School of Mines*' and that groups of collieries were placed in charge of the local sub-committee and the '*Director of Fuel Research*', Indian School of Mines. We are not aware if there is any officially recognised department styled as '*Research Department*' in the School of Mines and of the personnel of that department.

For the last few years a small amount of money has been placed at the disposal of the 'Research Department' of the Indian School of Mines to carry on research work to improve the method of soft coke manufacture. A perusal

of the report will also show that as a result of the so-called Research Department's investigations some very useful information on the manufacture of soft coke has been recorded. But what this 'useful information' is nobody is aware of and it is to be regretted that this useful information could not find place in the report and be made public. A few data are, however, published with regard to volatile matter and ash percentage of some soft cokes. These figures, without giving the names of the coal seams from which the soft cokes have been made, do not appear to be of any use except that they show the wide range of variation in the quality of soft coke.

The description of the soft coke prepared in India as given in the report (page 5) shows that it is nothing but a mass of charred coal, half-burnt coal, and more or less completely burnt coal. The report further admits that the quality of soft coke supplied by many collieries is often inferior. Stony coal is occasionally used in the manufacture. The method of manufacture has been going on for a very long time without any improvement or modification. The analyses that appear in the report amply demonstrate the poor nature of the majority of soft coke and that there is a very wide range in quality, some are practically unburnt and some are more or less completely burnt.

It was felt by the committee that the work of improving the quality of soft coke should be of a more practical nature and that arrangements were made with colliery owners to carry out practical tests but nothing is made known as to the fate of such tests. According to the report 'the trouble is to get manufacturers to recognise the importance of quality and one of the difficulties with which the committee are faced is that dealers do not buy on any specifications and consumers are only too eager to purchase in the cheapest market'. It is really very strange to follow this argument that the manufacturers for whose benefit cess is collected and for whose commodity so much propaganda work is being carried on do not recognise the importance of quality. In that case there should be no other alternative but to stop the cess altogether and the committee should dissolve forthwith. Regarding the other point it may be said that when a better grade smokeless fuel is produced and placed on the market the dealers and consumers will gradually take to the better commodity even at a reasonably higher price. This is amply demonstrated in every type of business.

I take exception to the report saying on page 16 that 'in burning very little smoke is given off', etc. while enumerating the advantages of soft coke. The analytical results published in the same report on page 6 go to contradict this statement and it is really unfortunate that such statements should be used. When a soft coke of better quality is produced it will surely have a ready sale with less propaganda.

The requirements of a good domestic fuel should be as follows:—

(1) It should have been previously treated for the recovery of by-products from the raw coal and so rendered smokeless.

(2) It should contain only a small amount of volatile, say 7 to 10 per cent, and be of such structure as to be easily kindled and kept alight in open fire-places and should require very little draught for combustion.
(3) Its radiant efficiency should be high.
(4) It should be dense and compact so as to minimise transport and delivery charges and require a minimum storage space.
(5) It should be sufficiently robust to stand normal handling and transport.
(6) The ash should be low depending on the nature of the coal from which soft coke will be made. In Bengal and Bihar coalfields we cannot expect low ash domestic fuels.
(7) It should require minimum attention during combustion.
(8) Its texture should be uniform.
(9) The price should be sufficiently low to attract purchasers.

The manufacturers of domestic fuel should try to obtain all these properties in their finished product. A reference to the literature on this subject will show that many patents have been taken out to carbonise the coal at 600°C. to obtain a smokeless patent fuel commonly known as *coalite* or *semi-coke*. The best procedure, however, would be one in which arrangements are made for the recovery of common by-products such as tar, ammonia and gas. The installation of a low temperature carbonisation plant or a Parker plant or a similar one with the arrangement to recover by-products would be an ideal thing no doubt but it need not be discussed here as there is hardly any scope to erect one at the different small collieries to use exclusively their inferior grade coals for the manufacture of semi-coke. If, however, the scheme for obtaining liquid fuel and other by-products out of Bengal and Bihar coals proves satisfactory and favourable then the residue left behind in the retorts will be obtained as an ideal smokeless fuel far superior to the low grade soft coke now marketed and it is sure to capture the market and replace the latter.

The question immediately before us, therefore, is to produce a better soft coke as domestic fuel from the inferior grade coals. The manufacture on an economic basis of a semi-coke having many of the properties mentioned in a previous paragraph involves a certain amount of research. Investigations in the following lines are necessary: Blending of different seams in certain proportions, suitable size of the coal particles to be blended and carbonised, and the amount of excess binding material in the caking coal to be available for taking up non-caking coal and uniform cellular texture of semi-coke and so forth.

Research work in some of the above useful lines has been in progress in the Geology Department, Presidency College, Calcutta, under my guidance and the results may be made available at an early date. As an example it may be said that the seam No. X of western Jharia side may take up as much

as 30% and seams VI, VII, VIII may take up 20% of some non-caking coal such as seam No. IV. Experiments with different sizes of coal particles show some variation in the capacity of blending. Practical tests in the above lines will have to be carried out for guidance in the process of manufacture. After having sufficient information on these points the next step is to improve the actual process of manufacture. It must be admitted by all that the method practised at the present day in burning coal in heaps requires immediate modification. It has already been overdue. Following this system it is impossible to get coke of uniform quality and wastage is also very high. Improved method of destructive distillation of coal out of contact with air has become imperative. The author has visited many places in the Bengal and Bihar coalfields where soft cokes are manufactured and, as a result of his experience, he suggests that simple chamber ovens, such as beehive or rectangular chambers, may be suitably constructed for the purpose with ordinary brick but having an inner lining of firebrick. There should be arrangements to allow for expansion that will occur during low temperature carbonisation but research work will help in avoiding unusual expansion. There may be a movable iron framework at the bottom of the chamber to receive the coal charge and after the operation the coke may be raked out. Simple chambers may easily be constructed to carry out carbonisation without any access of air at low temperature (500°C. to 600°C.) without any arrangement for recovery of by-products and gases. This simple method will give a much better coke than what is manufactured at present. The manufacturers should be encouraged to install chamber ovens with suitable arrangements to recover some of the by-products and gas. There should also be simple arrangements for heating by burning gas in the flues and combustion chamber and also for recovery of gases. The author of this note has prepared a sketch of one such chamber oven which will be published elsewhere. Colliery owners and those who are manufacturers of soft coke should immediately start small experimental chamber ovens to carry out the practical tests. The temperature should be regulated at will and should be in the neighbourhood of 500–600°C. The period of heating is to be actually determined by trials and should be well within 24 hours. Of course, it depends on the nature of the ovens and the amount of the charge, the size of the coal particles, moisture content, etc. The coke thus produced will have a more uniform nature and quality and will be a suitable smokeless fuel for domestic use. When generally adopted a large amount of useful materials such as tar, ammonia, etc. will be made available for our different uses. One will be surprised to know that about 0·75 million gallons of motor spirit, 1·5 million gallons of light oil (kerosene), 3 million gallons of lubricating oils, 0·75 million gallons of carbolic acid and creosote oil, 10,500 tons of ammonium sulphate, 15,000 tons of residual pitch and about 7·5 billion cubic ft. of very rich gas are at present being wasted during the annual soft coke making from the Jharia coals only (see S. K. Roy—Presidential Address, *Proc. Ind. Sc. Congress*, 1939, p. 72). Attempts to install chamber

ovens with arrangements to recover some of these by-products will save some valuable material from being lost and this will be a move in effecting the conservation of a national asset to some extent.

The Soft Coke Cess Committee would act wisely if they carry on some propaganda work to induce the manufacturers of soft coke to adopt suitable blending of different coal seams and to use chamber ovens for low temperature carbonisation process so that better quality cokes may be placed on the market. The committee should be moved to award several prizes and to offer a substantial bonus to those manufacturers who take to improved methods of manufacture. These prizes and bonuses may be fixed on a sliding scale according to the nature and stage of improvement. Immediate and serious attempts should therefore be made by the committee to move in the matter as such an improvement in the soft coke manufacture has long been overdue and continued research on the lines already suggested will help the manufacturers in the proper selection and blending of coal seams, in having suitable size of coal particles for carbonisation and in other ways to impart good physical properties.

The author also suggests that small colliery owners should combine and form bigger concerns and economic units so that better methods and plants with full scientific equipment might be easily adopted for the manufacture of smokeless domestic fuel on a bigger scale. The recovery of by-products may then be a simple and easy affair to tackle. The author sincerely hopes that the Soft Coke Cess Committee will spend sufficient money to encourage and help the enterprise in this direction which is of fundamental importance.