BRIQUETTING OF COAL IN INDIA.

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This is a subject that, like that of the cleaning of coal, has not had given to it the attention, by practical men, that it appears to deserve. Enormous quantities of Indian coals that are for one reason or another classed as 'waste' or 'low grade' are not satisfactorily disposed of, and the history of the coal-mining industry furnishes innumerable instances of such waste or poor-selling material being (usually temporarily) a drug on the market and presenting a serious problem to the industry. Fluctuations in the requirements of the various grades and sizes of coals, as regards both quality and quantity, alter the aspects of the associated problems, but it will probably be admitted that the disposal of slack coal, even though it is not at present a specially urgent problem, has been a cause of great concern to the industry in the past and may be so again in the future.

So far as utilisation of slack coal is concerned the development of chain grates and automatic stokers as well as of pulverised coal has, of course, mitigated this evil. There are times, in fact, when the smaller sizes of coal fetch a higher price than the larger. But there are coals in India that are so extremely friable that even locally their utilisation is not yet satisfactorily dealt with. Particular reference might be made to the coals of Assam and the Punjab. These latter cannot be satisfactorily used on travelling grates, or at least not so satisfactorily as coals of better coking quality. Their conversion into briquettes would appear to be one possible solution to an undoubted problem.

But the briquetting of coals is a method of treatment that need not be confined to those friable deposits, and the possibilities of briquetting slack coal of the Raniganj and Barakar Series and of other Gondwana coals may yet become an important subsidiary industry.

What are the main problems ? They are : (*a*) selection of a binder and its cost, (*b*) selection of a process or of a type of briquette (the word is used in its most general sense).

Now the earliest type of binder used is the one that is still the most successful and the most favoured, namely pitch. There are many different types of pitch, *e.g.* coal-tar pitch, petroleum pitch, etc. The latter is the best for consolidating small coal into a coherent form, as a smaller percentage is required than when coal-tar pitch is used, and coal-tar pitch does not give

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such a good 'finish' to the product. But coal-tar pitch is much cheaper than petroleum pitch. In Britain the former costs about 30*s.* per ton (at present, 1939, on account of large surplus stocks, the price is as low as 21*s.* per ton). Petroleum pitch costs, in Britain, as much as 70*s.* per ton. One firm manufacturing small (ovoid) briquettes uses as little as 4½ per cent of petroleum pitch as against 7 per cent of coal-tar pitch. The total briquetting costs in the U.S.A. amount to about one dollar per ton; $1·06 is given as a recent average, which is equivalent to Rs.3 approximately, the pitch accounting for Rs.2-2-0.

The corresponding prices for India are not at present available. Unfortunately, therefore, it is not possible to offer reliable comparative figures for the process. But a year or two ago pitch was selling at about Rs.35 per ton, and more recently the price has been as high as Rs.58-8-0. Taking the lower figure and allowing for, say, 5 per cent of pitch for binding the small coal into coherent form we see that about 5 per cent (*i.e.* approximately one-twentieth) of Rs.35 has to be added to the price of coal per ton to obtain the price of the briquette, without taking into consideration the cost of the process. An addition of approximately Rs.2 per ton for binder alone is thus inevitable under present conditions.

What is the alternative? Theoretically there are several. One obvious one is to substitute, for coal-tar pitch, a cheaper binder. Many have been tried, and such substances as rice husks, bisulphite waste liquor from the paper-making industry, molasses, waste jute products, etc. are obvious suggestions. But nearly all these substitutes have been found to give briquettes that do not stand the severe tests of a tropical climate. The soft coke industry and perhaps the low temperature carbonisation industry, if it is ever established in this country, will probably offer a part solution to this problem by providing a cheaper pitch. The author favours the development of the soft coke industry along lines that would involve no very great departure from present methods other than to attempt to recover a substantial proportion of the tar. Even at the risk of adding to the present alleged surplus of coal tar it might be worth while rendering available larger quantities of tar to provide the necessary pitch. Whether the plastics industry will provide an outlet for the other distillation products and thus solve the parallel problem of their disposal only time can tell.

The obvious solution at present is to avoid the use of a binder entirely, *i.e.* to try to make briquettes without a binder and thus avoid adding this source of direct expense. Till recent years attempts to briquette coal without a binder have not met with much success. Six years ago the author personally investigated the claims of one promising process, but a short time after his return to India it was learned that the process had not been a commercial success. Later information (obtained privately a few months ago) is to the effect that methods for consolidating coals without a binder are now

economically sound. The more interesting and important fact, so far as India is concerned, is that certain Indian Gondwana coals are eminently suitable for the manufacture of briquettes without the use of a binder.

The pressures used in this type of briquetting process vary within wide limits, as much as 20 tons per square inch being necessary to consolidate anthracites and anthracitic coals, but coking coal slack has been, and is being, successfully briquetted at as low a pressure as 1·5 to 2 tons per square inch. But these lower pressures are generally found possible only by first heating the coal to the temperature of incipient fusion, *e.g.* about 450°C.

Agglutinating long-flame and other high-volatile coals require a higher pressure, *e.g.* up to about 6 tons per square inch, accompanied by heating to the optimum temperature, usually a temperature ascertained within fairly narrow limits, from 400°C. to 420°C.

The great advantage of 'pure coal' briquettes, as these non-binder forms of consolidated 'smalls' are sometimes called, is their comparative smokelessness. Pitch used as binder adds greatly to the smokiness of the product when burnt.

So far as costs go, the pitch processes would appear to be more expensive than those employing high pressures and no binder. Figures for manufacture of small briquettes ('ovoids') in England vary from as little as 5*s.* per ton, using no binder, to 7*s.* 6*d.* per ton, using pitch. But these figures must be accepted with caution as every head of expenditure in India gives rise to totally different costs. Careful calculations made in very recent investigations show that the cost of making ovoids without the use of a binder would probably be approximately Rs.2-15-0 per ton. (Private communication.)

The other problem of selection of type of process is equally interesting. The word 'briquette' means, of course, small brick and, by extension, brick-shaped article. Originally briquettes were manufactured by consolidating extremely low-grade slack and dust coal into brick-shaped lumps and were used either on railways (as is a widespread practice in France and Belgium) or as a domestic fuel. Some of the briquettes commonly used by railways on the Continent are two or three times the size of ordinary bricks and the name is no longer strictly appropriate. These large brick-shaped briquettes offer the advantage of economy of space in storage, on account of their permitting regular stacking.

At the other end of the scale we have the more recent development of the manufacture of extremely small lumps usually egg-shaped and known as 'ovoids'. The present author strongly advocates the development in India of the manufacture (without the use of a binder, if possible) of ovoids for all purposes requiring a solid fuel whose combustion should be easily and, if necessary, scientifically controlled. And ovoids present the special attraction that they will probably always be more likely to be successfully manufactured without the use of a binder than can the orthodox briquette.

There would appear to be scope for the development of a pitch-making industry in conjunction with the soft coke industry solely for the purpose of providing a cheap pitch for briquette-making and also for the manufacture of ovoids from small and dust coal without the use of a binder. Recent investigations by experts have conclusively proved that Barakar and Raniganj coals are definitely suited for the processes.