Discussion: The beneficiation of fine coal by dense-medium cyclones*, by P. J. F. Fourie, P. J. van der Walt, and L. M. Falcon

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The above paper gives a fair amount of information and is a useful addition to the literature on a subject of growing importance. I believe that more experimental results could have been given, together with more details of the modifications made to the plant that enabled it to operate with the success mentioned in the paper. One important omission is a definition of the word *fines*. As pointed out elsewhere[1], this word is used very loosely. (The small-coal washing plant at one mine, which treats minus 6 mm materials, is regularly referred to as a fine-coal washer.) The authors overcome this difficulty to a certain extent by referring to 'minus 0,5 mm' fines. In fact, as the authors should know, few fines so described are genuinely minus 0,5 mm: most are closer to minus 1 mm. However, of paramount importance is the size grading: all papers on this subject should at least include a size analysis of the feedstock under discussion.

The authors would have given readers a more complete picture of the dense-medium cyclone plant if they had provided some account of the background to its construction. I shall try here to rectify that omission.

The suggestion that dense-medium beneficiation should be examined for South African coals was made[2] in 1972, at the Conference 'Coal in the Seventies', although the paper was published only much later. The work of Deubrouck was quoted, and an account was given of the simulations carried out, using computer techniques, on South African fine coal. This was the first such work *specifically* carried out on fines.

The concept was further advanced[3] at the SAIMM Colloquium held in September 1974, 'Heavy-medium Separation and Ore Sorting'. In the section on 'Fines Beneficiation', reference was made to the possible use of a cyclone dense-medium system, and computerization techniques were advanced to give, in graphical form, the levels of efficiency required to meet export specifications. The relevant graph, which is given in Fig. 1, shows that the 'conclusion' reached in 1977 by Fourie and Erasmus regarding the efficiency levels required (page 357 of the paper) was a re-statement of the conclusions given in greater detail in 1974.

This work had already been taken up by the Anglo American Research Laboratory (AARL), and the first

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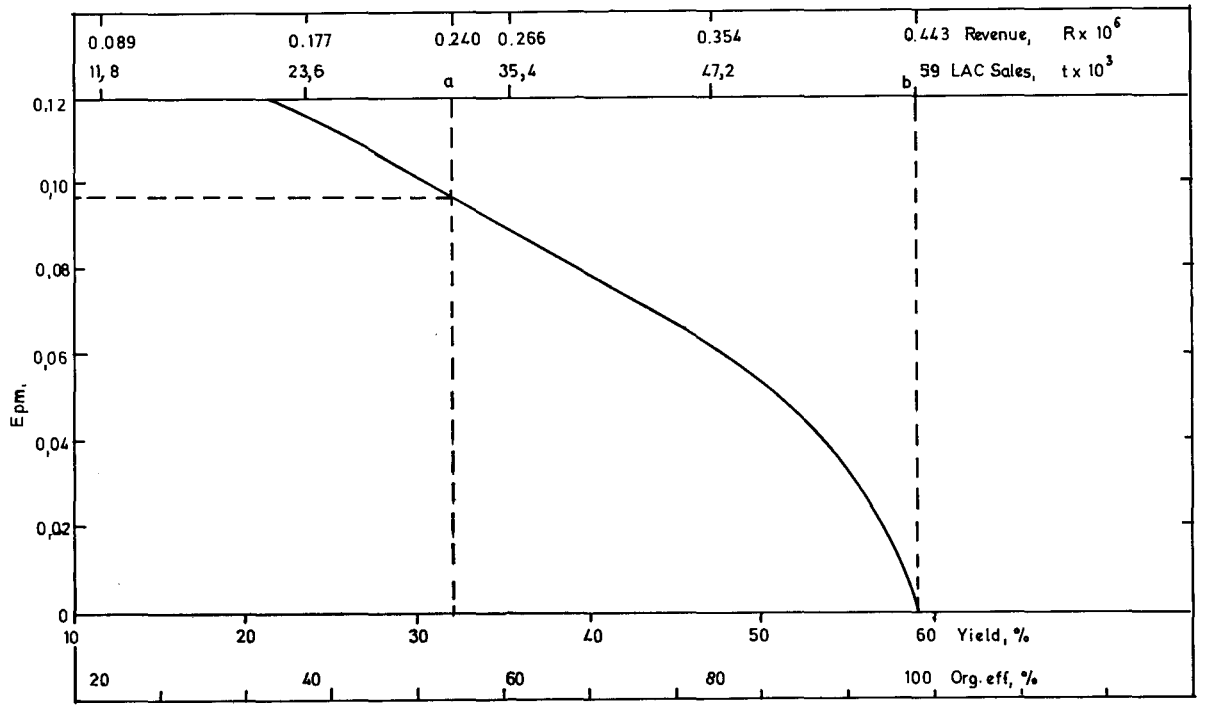

Fig. 1—The levels of efficiency required in a cyclone dense-medium system treating 0,5 mm fines[3]

(a) = revenue if coal sold untreated. (b) = maximum theoretical revenue.

tests specifically on the treatment of fines by dense medium were carried out on their premises. AARL's results were included in the 1974 paper[3] and demonstrated that, of all the processes under investigation, only that tried at the Anglo American Research Laboratories had succeeded in producing low-ash coal at acceptable yields. At that stage, apart from the results reported in 1949 (in which a much greater size range of coal was treated), the Fuel Research Institute (FRI) had not included any dense-medium work in their own fines-beneficiation programme.

With the agreement of Anglo American, AARL's results were communicated to the FRI in the form of a memorandum[4] in 1975. I presented this in my capacity of Coal Preparation Representative on the Research Advisory Committee. In the memorandum, comment was made on the failure of other methods to achieve success; the potential benefits in foreign revenue from the successful treatment of fines were outlined, the success of dense-medium beneficiation was revealed, and a suggestion was made that the FRI should start pilot-plant work to study the matter in depth. The Board of the FRI accepted the contentions, and a sum was voted for the construction of the pilot plant.

In a paper[5] presented at the SAIMM Colloquium on pilot-plant operation, specific detail was given on the advantages of treating fines on their own, as distinct from treating them with coarser sizes. This conclusion, in fact, distinguishes the South African work from that carried out (and even more extensively) in other countries.

References

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Authors' reply

We thank Mr Horsfall for his contribution amplifying the background to this project. We would point out that our paper was primarily a report on the results of a test programme carried out on the pilot plant, and that its scope did not permit a comprehensive literature survey.

Historical reference was made only in so far as it appeared desirable to give the reader a clear understanding of the problem. No slight was intended by the omissions he mentions.