Colloquium on 'Froth Flotation'

Held on the 22nd March 1972 at Kelvin House.

Four papers were presented at this colloquium, which was attended by approximately 120 people.

The first paper, 'Flotation Research Work at the N.I.M. research group, University of Natal on the modelling of a Flotation Process' was presented by Dr R. P. King, the leader of the N.I.M. Research Group in the Department of Chemical Engineering at the University of Natal. A discussion panel, under the chairmanship of Dr R. E. Robinson with Mr M. Dawson (PMC), Mr E. Roux (FOSKOR), and Dr B. K. Loveday (NIM), discussed the potential application of the theoretical work on flotation modelling to industrial processes, and alternative approaches to providing a way of control of flotation plants.

The second paper, 'Fundamental Studies of the Flotation Process the Work of the National Institute) for Metallurgy', was presented by Dr N. P. Finkelstein. The discussion panel for this paper was under the chairmanship of Professor D. D. Howat,and had as its members Mr H. P. Carlisle (JCI), Professor D. le Roux (University of Pretoria), and Mr E. Rudolph (Anglo American Research Laboratories). A lively discussion on this paper ensued, with several contributions from the floor.

After lunch, Mr S. K. de Kok, Assistant Consulting Metallurgist, Anglo Vaal, presented a paper on 'The Flotation of Copper and Zinc Sulphide from Prieska Ore'. The paper was discussed by a panel comprising Dr V. C. Lovell (NIM), Mr A. Gilbert (General Mining), and Dr D. Legge (Anglo Vaal), under the chairmanship of Dr L. Bushell. This discussion, in which many members of the audience participated, revolved around the difficulties associated with the production of copper and zinc concentrates and the lack of fundamental information on the behaviour of copper and zinc sulphides in flotation.

The final presentation was a paper, 'The Recovery by Flotation of Cassiterite contained in Gravity Concentration Plant Tailings', presented by Mr E. B. Viljoen (Metallurgy Department, Goldfields South Africa Limited). The discussion, led by a panel consisting of Mr O. Tant (Goldfields Laboratories), Mr J. Levin (NIM), and Mr R. I. Shanks (NIM), under the chairmanship of Mr H. Cross (Goldfields South Africa Limited) referred particularly to the use of new reagents for the flotation of tin, with particular emphasis on the fundamental relationship between reagent composition and its ability to float this type of mineral.

Discussion

Flotation research work at the N.I.M. research group, University of Natal

By Dr. R. P. KING

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Dr. P. J. Lloyd

I think that the author is to be congratulated on extending the mathematical modelling of the flotation process to include those many variables described in his paper. However, I wonder whether he has not now gone as far as he can hope to go. In essence, a flotation plant has an input stream, a product stream and a waste stream, and the properties of the product stream can only be characterised by a few variables or functions e.g. the moisture content, the total weight, the percentage of valuable product, the particle size function of the valuable minerals, the particle size function of the gaugue minerals in the product stream, and, possibly, a composition function for the aqueous phase. Thus one can only describe the product stream by a relatively small number of measurable functions, and I have a feeling that the number of variables used by Dr King may be approaching the number usable to describe the product. In mathematical terms, he may be approaching an ill-conditioned solution, at which point the physical reality of the variables he measures may completely disappear.

An analogy may make this clear. In the symphony, the piccolo player may become aware that his instrument is slightly off pitch. The conductor may only be aware of an error if the piccolo plays on *A* rather than *B*. The audience will miss both faults. A sensitive frequency meter, set to the supposed pitch of the piccolo, will detect the errors conclusively, but will miss the value of the product Beethoven.

Thus my questions to Dr King are as follows:
To what extent has he been able to perform a sensitivity analysis to determine the significance of the many variables in his model? If he hasn't yet done the analysis, when does he believe the stage may be reached where it will be necessary to do it? Finally, can he give us any guide to the sort of mathematical tools available to perform the analysis?