

SPOTLIGHT

on control and simulation

by B.K. LOVEDAY*

A Colloquium on 'Control and Simulation in the Minerals Industry' was held at the Holiday Inn, Milner Park, on 20th September, 1984, in conjunction with the Electra Mining Exhibition.



Dr B.K. Loveday, Chairman of the Organizing Committee, giving the welcoming address

A total of 170 persons attended the very full morning programme, which began with an opening address by the President, The South African Institute of Mining and Metallurgy, Mr J.D. Austin. He outlined the reasons why computers were being used to an ever-increasing extent for control and simulation in the minerals industry. The computer was even used to check, among other things, the validity of the signals it was receiving by mass-balance calculations.

The two sessions of four papers each were chaired by Mr P.J. Mostert and Mr W.R. Flook. Thirty minutes were made available for the presentation and discussion of each paper, and in general the lively question-and-answer sessions were limited by the clock.

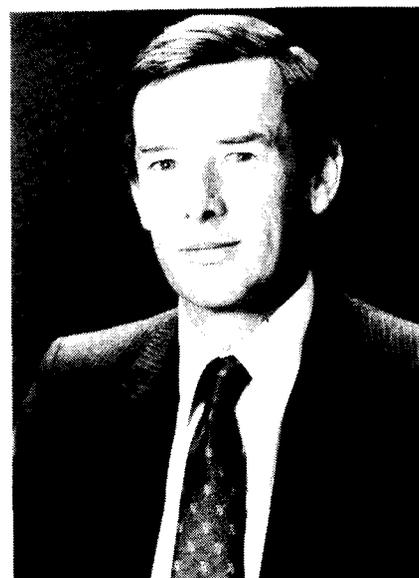
Simulation

Professor R.P. King reviewed the development of models for unit operations in the minerals industry and

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the methods used to simulate complete circuits. He then illustrated how the use of different models can lead to different answers. The examples used were the desliming of cassiterite ore with multi-stage cyclones, the upgrading of fine coal by the use of dense media, and differential flotation. In all cases, variations in circuit configurations were investigated.



Mr J.D. Austin, President of the SAIMM, who presented the opening address



Mr P.J. Mostert, Anglo American, who was a Session Chairman



Left to right: Dr B.K. Loveday, Mr H.E. James (Mintek), and Mr W. Flook (Gencor)



Left to right: Professor R.P. King (University of the Witwatersrand), Mr M. Kongos (Outokumpu Oy, Finland), and Mr D. Barker



Left to right: Mr C. Hunt, Dr I.J. Barker, and Dr A.L. Hinde



Left to right: Mr T.R. Twidle (Black Mountain Mineral Development Co.), Dr A.K. Haines (Gencor), and Mr J. Chadwick (International Mining, U.K.)



Left to right: Mr G. Sommer (Mintek) and Mr G.I. Gossman (Gold Fields of South Africa Ltd)

The second paper, by Mr C. Hunt and Dr A.L. Hinde, was entitled 'Statistical aspects of material balancing'. This paper illustrated how information on the accuracy of sampling and assay methods can be used to quantify confidence limits on mass balances.

The discussion included a query about how Professor King's flotation model could predict the effect of changing air rate. A suggestion was made that simulators should include capital- and operating-cost parameters for feasibility studies.

Control of Mills

The first paper, by Mr O.G. Pauw and co-authors, described the system used to optimize the production of pebble mills at the Buffelsfontein Gold Mine. The importance of time lags in the system was highlighted — a feature that analogue controllers have difficulty in handling adequately. A 3 per cent increase in throughput was attributed to the introduction of the control system.

The second paper, by Mr G.I. Gossman and co-authors, summarized the benefits derived from the introduction of multivariable control to a rod mill-pebble mill circuit at the East Driefontein Gold Mine. It was estimated that the cost of the instrumentation and computer was recovered in under a year (by finer grinding of the same tonnage). One of the interesting observations was that the operators were able to improve the operation of other circuits without the computer, but by observation of what the computer did.

Control of Submerged-arc Furnaces

A paper presented by Dr I.J. Barker summarized the work of the Mintek team on improving the productivity of a ferrochromium furnace. An off-line simulation of

the interaction of the electrodes was the key to understanding how to control the movement of the electrodes. The computer was also very useful for calculating and monitoring the addition of ore, flux, and reductant. A substantial increase in productivity had been obtained.

The second paper in this session, by Dr B. Strohmeier, illustrated how a computer had been used to record data and to generate appropriate reports for each level of management. Among other things, the shift reports stimulated healthy competition between shifts. Productivity had been improved significantly through the provision of a means of calculating flux requirements, time, etc. The consumption of refractories and electrodes had decreased very substantially as a result of the closer control of the operation.

On-stream X-ray Analysis

The first paper was by Mr T.R. Twidle and his co-authors on 'Developments in stabilizing control at Black Mountain'. The Courier analyser and optimizing computer had proved to be very reliable, and back-up laboratory staff had been reduced substantially. The interaction between reagents and concentrate grades and recoveries had been monitored, and had led to the use of feed-forward and feed-back control of reagents and air to minimize fluctuations in plant performance.



Left to right: Dr H. Wagner (Chamber of Mines of South Africa) and Mr G.B. Lindstrom (Vaal Reefs)

A paper presented by Mr D. Barker, entitled 'Automation systems at Outokumpu Oy's refineries', described the application of on-stream X-ray analysis to a hydrometallurgical plant (copper-nickel). The flexibility of a computer-based system was emphasized (e.g. reports, graphical trends, interaction and terminals).

General

The sustained attendance and lively comment indicated that the Colloquium had been both interesting and useful to the participants.