

SPOTLIGHT

on measurement, process control, and optimization

by P.C. VAN ASWEGEN* and J.S. FREER†

The Schools

A school on 'Measurement, Process Control and Optimization in the Minerals Industry', organized by The South African Institute of Mining and Metallurgy, was presented twice by course leader Dr Ken Garner, ably assisted by the staff of the Measurement and Control Division of Mintek. The first school was held from 16th to 20th July, 1984, at the University of the Witwatersrand, and the second from 11th to 15th February, 1985, at Mintek.

Both schools were over-subscribed, with some seventy delegates from Southern Africa and overseas representing the metallurgical and process-control industries, universities, and research organizations. This reflects the intense interest and demands from these bodies to understand and to use this modern, rapidly developing technology.

Official Openings

The first school was opened by Professor R.P. King, President of the Institute at the time. Referring to the

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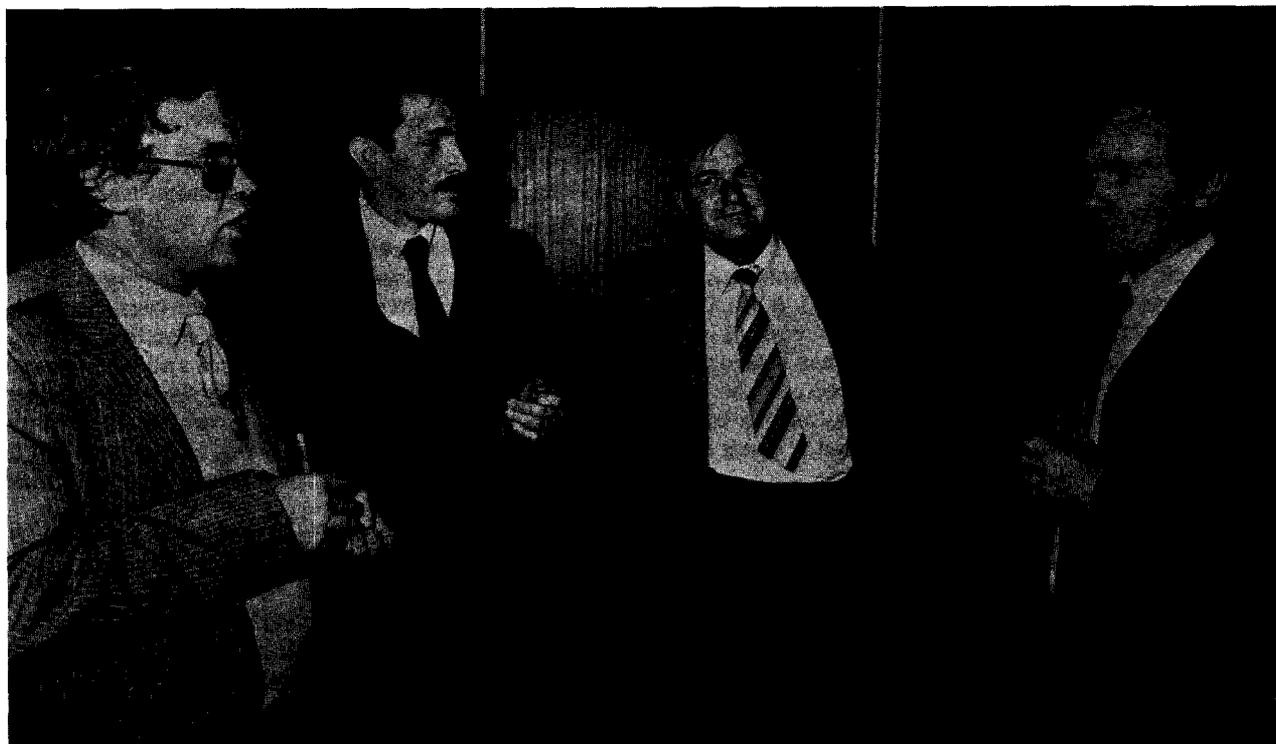
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Both of General Mining Union Corporation (Limited), 74-78 Marshall Street, Johannesburg 2001.

number of applications to attend the School, he stressed not only the popularity of the SAIMM Schools but also the relevance of the subjects presented. In reviewing the course content, he had noted that the subjects related to computers, reliability, control, and simulation. He expected that the message delegates would be taking back with them would be the importance of the reliability of process control in an operating environment.

In his opening address to the second school, President John Austin noted that, contrary to the situation in the earlier days of the minerals industry, process control was making an increasing contribution to profitability, which could be larger were it not for the shortage of skills associated with the design and implementation of control strategies and a lack of people with the understanding and training to maintain the systems that were installed.

Problems seem to exist at both ends of the scale. While process control is included as a subject in engineering curricula at our universities, tertiary education makes no formal provision for the training of process-control engineers as such, nor do the staff structures of many employers in the mining industry include this important and specialized profession in their teams.



From left to right: Dr Hugh Bartlett, Professor Ian MacLeod, Mr Gunter Sommer, and Dr Ken Garner relaxing over pre-dinner drinks at the Convocation Centre, University of the Witwatersrand

The engineer who makes it his business to understand the fundamental requirements of the process and designs accordingly is the exception. Until the niche on mines and plants for this specialist to provide co-ordination between engineering and process is recognized and filled, the potential for improving productivity and profitability through reliable process control will not be met.

Technical Programme

During the 2 one-week courses, 16 technical lectures, supported by case studies and tutorials, were presented. Technical visits were paid to 2 plants in which process-control systems were in operation, and the schools ended with a panel discussion.

Social Activities

On the social side, a dinner was held for the first school on the first evening (Monday) at the Convocation Centre of the University of the Witwatersrand, and the week ended with a cocktail party on the Friday afternoon.

For the second school, a cocktail party and a lamb-on-the-spit braaivleis were held consecutively on the first evening at the Mintek recreation area. The occasion was convivial, and gave delegates, lecturers, and senior representatives of both Mintek and the Institute an opportunity to get together in an informal atmosphere.

Technical Lectures

The course content and presentation were drawn up by Dr Ken Garner, and Mr Gunter Sommer and his team at Mintek, in close collaboration with members of the Institute's School Committee (Extractive Metallurgy). The lectures were delivered by Mintek personnel, staff members of the University of the Witwatersrand, and employees of private companies operating in the process-control field—all experts in their respective subjects.

In the first lecture, Mr Sommer sketched the background and potential for instrumentation and process control in mineral processing and was followed by Dr Bruce Stewart, who dealt at length with various aspects of measurement in which he stressed the importance of reliable instrumentation to provide accurate information about the process for effective control and optimization.

Dr Hugh Bartlett spoke about on-line analytical instrumentation and sampling, and Professor Ian MacLeod on a three-term controller. The underlying message in Dr Garner's lecture on operability studies was that, in the design of a control system, it is important that the designer should have a thorough understanding of the process itself and should ensure that what is being done is known to all concerned.

Mr Gossman, in his lecture on control instrumentation for milling on an operating gold plant, brought back a feeling for the real world outside before the group was plunged back by the experts into Inverse Nyquist Arrays, modelling, and simulation.

The practical aspects of design standards, control valves and actuators, control-room design for the interface between operator and controller, and the application of programmable controllers were dealt with by lecturers from the process-control industry. In the final lecture on the management of projects, Mr George Brown

was able to show the successful implementation of a control strategy through teamwork and close attention to detail.

Case Studies

Relevant case studies and tutorials were worked through. A system for the control of product size and circulating load in a milling circuit was designed, as was a system for the control of a fluidized-bed reactor. A most impressive demonstration was given of the use of computer simulation programs in the design of flowsheets and in the simulation training of plant operators.

Plant Visits

The delegates were indebted to East Driefontein Gold Mining Company Limited and Rustenburg Refineries (Pty) Limited, who hosted visits to their plants on the Wednesday afternoons. At East Driefontein, the main factors of interest were the microprocessor-based multivariable control of the No. 1 milling circuit, and the control centre from which all the plant units can be stopped and started. At Rustenburg Refineries, the total plant operation is controlled from a central room, where a supervisory computer with two visual display units is used. Efficient control is achieved with this system, and the computer availability is very satisfactory.

At both plants the operators have adapted very well to the systems and have accepted that a plant can be controlled remotely. Both visits were very informative and, besides being a welcome relief from the intensive lecture programme, brought a sense of reality and purpose to the school topics.

Panel Discussion

At the end of the week, a panel discussion was held between the lecturers and the delegates to review the course as a whole, and to identify how process control can contribute to increased productivity.

The following main conclusions were drawn.

- Process-control engineering is a discipline of its own, lying between process engineering and instrumentation engineering.
- To design a successful process-control system, one must have a full understanding of the process itself. It is not sufficient to superimpose instrumentation on the process and expect to get satisfactory control.
- For these reasons, process-control and instrumentation engineers need to work closely together in designing process-control systems. Likewise, the process department of a plant must work closely with the instrumentation department for effective modifications and maintenance.
- Instrumentation staff need to have a very good understanding of a process in order to set up an optimum control strategy.
- There is an apparent gap in the spectrum of courses available to undergraduates since no university in South Africa offers a course in process-control engineering.
- Process-control systems offer the opportunity for operators to be trained by simulation using the same system. In doing so, the teaching is much faster than

by formal instruction and experience.

- The mining industry needs to recognize the value of employing Professional Engineers in instrumentation and control on the mines themselves. At present, the most senior instrumentation man is likely to be at foreman level.

Conclusion

There is no doubt that the schools were a great success. The material presented was of a high standard, and

the interaction between delegates and lecturers proved to be very stimulating.

Delegates became more aware of what process control can do for plant operations and where they can find the expertise. They also became more aware that effective process control is achieved through cooperation, understanding, and team-work among all concerned in the engineering and process fields.

The Institute and the organizers are to be congratulated on the fine arrangements and their choice of a very relevant topic.

Project development

The Sydney Branch of the Australasian Institute of Mining and Metallurgy will hold a second Project Development Symposium in Sydney between 7th and 10th October, 1986. This second symposium will extend the range of topics covered by its predecessor in 1983 to emphasize planning (including strategic planning), construction, and project commissioning.

Members and non-members alike are invited to submit abstracts of papers for consideration by the symposium organizers. As a general but not exclusive guide, papers should fall within one of the following categories:

- Strategic planning: project selection and competitor analysis
- Mining method selection and mine design
- Materials handling and transportation
- Metallurgical sampling
- Process plant design
- Project planning and management
- Construction methods for remote locations
- Cost estimation practice and cost control
- Mine/plant commissioning
- Mine/plant utilities and infrastructure
- Development case studies.

Preference will be given to papers with a practical 'nuts and bolts' approach to their chosen subject, and papers that also look ahead, adapting past experience to current and likely future situations.

In recent years, much has been said and written about

the increasing levels of risk and uncertainty faced by the mining and mineral-processing industries. Papers addressing risk analysis and minimization from project conception through to operations will be of particular interest. Consideration will be given to a workshop format for the presentation and discussion of case study papers.

In the first instance, intending authors are invited to discuss their ideas with the following (in Australia):

- Bill Duchatel, Convenor,
Pancontinental Mining Limited,
(02) 231-1022 Telex: 22825
- Dick Knight,
Peko-Wallsend Limited,
(02) 498-4566 Telex: 24622
- Angus Robinson,
Department of Mineral Resources,
(02) 240-4617 Telex: 74875.

Abstracts, of 200 words or less, must be submitted no later than 31st August, 1985. Final manuscripts will be needed for publication by 30th April, 1986.

Please address all correspondence to

The Convenor,
The Second Project Development Symposium,
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