

Artificial intelligence in process engineering

The Western Cape Branch of the SAImm recently held a one-day colloquium on the use of artificial intelligence (AI) in process engineering in the J.S. Gericke conference room at the University of Stellenbosch.

OPENING SESSION

After the opening address by the Chairman of the Western Cape Branch, Professor Cloete, Professor Van Deventer discussed the ill-defined nature of chemical and metallurgical processing operations and the role that AI techniques could play in improving both our understanding and modelling of such processes. This was an excellent introduction to the papers for the day, especially as it was followed by a most lucid discussion on the use of neural networks (NN) for the estimation of process models, by Professor E. Barnard of the University of Pretoria. A new modelling approach for sparse data sets, as is often found in the process industries, was covered by Tjaart van der Walt, a PhD student at Stellenbosch.

SECOND AND THIRD SESSIONS

The second session, on fault diagnosis and simulation, had two papers: the first on the limitations of neural networks as a modelling technique when compared with conventional techniques, the second describing a technique for the simulation of process networks using various neural network architectures.

The session on process control was introduced by Professor Ian McLeod from Wits, who gave a most interesting presentation on the study of intelligent, real-time control. This paper gave some fascinating insights into new control strategies that allow for faults occurring, and decision-making at a local level rather than from a master unit. The paper by Werner Trossbach of UCT showed that operators can use neural networks to control processes by first learning about their operation, and then using them in the control strategy, giving an indication of the potential of self-learning controllers for the future.

milling, magnetic separation, leaching, and precipitation. Various ore types have been investigated, such as manganese ore, lead/zinc/copper ore, vermiculite, chromite ore, and beach sands.

Analytical equipment is urgently required in the laboratory to assist it to function as a viable concern. At present, specimens are sent out for analysis, which takes time and adds to the running costs of the laboratory.

AFTERNOON SESSIONS

After lunch, the emphasis moved from neural networks to expert systems, with two papers from industry on their application. The paper by Johan Pienaar of ESKOM highlighted aspects of the system design required to incorporate expert systems, while that of Mr Mostert of Stellenbosch showed that an expert system can perform extremely well in an industrial environment to optimize power consumption. Professor Van Deventer closed the session with an expert-system approach to simulation, another paper showing the benefits of the use of knowledge and experience in computer applications traditionally regarded only as numerical data.

The formal proceedings closed with a panel discussion that fielded questions from the audience to both the speakers and the persons in the audience. The conclusion of this was that the practical use of neural networks in industry is certainly not in dispute any longer. It was also indicated that the tools of AI development are not prohibitively expensive and that it is possible for most companies to investigate the use of AI techniques in their operations very cheaply.

CLOSURE

The Colloquium closed with a cocktail party that allowed further discussion between delegates. All in all, this was a most successful colloquium in the Western Cape, and one that will, if the interest in the field continues to grow at its present rate, again be held in the future.

For further details of the Colloquium or other activities of the Branch, please contact

Mrs M. Winter
Department of Chemical Engineering
University of Cape Town
Rondebosch 7700
Cape Province.

Hydrometallurgical and pyrometallurgical equipment is required so that the whole field of extractive metallurgy can be covered.

INFORMATION

More information about the laboratory is available from Chris Viljoen at (016) 85-2221, ext. 305 or 241, at the Department of Metallurgy, Vaal Triangle Technikon.