could be expected to increase with increased cutpoints.
To enable us to evaluate the impact of densifiers on our circuits, we had to make sure that there would not be a dramatic drop in performance efficiency at higher cutpoint densities in the primary cyclone. Tests at higher separation densities were conducted, and Epm values of between 0,011 and 0,020 RD were obtained with cutpoint densities between 1,90 RD and 1,95 RD. The organic efficiency varied between 99,4 and 99,7 per cent at specific float ash values. Tromp efficiencies of about 96,3 per cent were obtained. (We define the Tromp efficiency as the error area divided by the total area—a two-dimensional parameter.)
The reference in the paper to the expected drop in performance at higher densities therefore refers to earlier results at the Mine, and not to the actual results referred to in the Tromp curves. As Dr Van der Walt correctly points out, the performance at the higher densities did, in fact, improve. This improvement can be attributed to a general decrease in the amount of near-density material and to reduced contamination of the circulating medium, which would seem to counter the negative effect of increased volumetric loading of the circulating medium with magnetite at higher densities.
The purpose of Figure 7 was to indicate that no dramatic flattening of the curve takes place at higher separation densities, and therefore there is no real risk of losing performance efficiency at separation densities of the order of 1,94 RD.

- Dr Van der Walt correctly pointed out that the results shown in Figure 7 are not consistent with the data reported in Table II, or the calculated values for Epm reported in Figure 7. These values were calculated by use of a computer program developed by the Mine. Unfortunately, the print-out of this program is not suitable for publication in the *Journal* as a result of poor graphic resolution, and the authors had to make use of a well-known graphic software package to fit the Tromp curve to the actual data points. In this process, the curve lost its actual sharpness, and the calculated values were therefore presented at the bottom of the graph.

  The authors regret that this manipulation of the graph misled Dr Van der Walt, and therefore have asked the Institute to send him all the raw data used in the determination of the Tromp curves. The print-outs of the computer program are included, since we are sure Dr Van der Walt would like to verify the accuracy of the program by manual calculation.
- The run-of-mine material treated at the Grootegeluk I plant consists of material originating from three mining benches in the Upper Ecca. Since the material from two of these benches is normally blended, the authors decided to calculate an average washability curve from the washability data for all three benches.

  This curve was shown in Figure 6 of the paper, and was used in the determination of the overall potential of this project in the long term. The results in Table II are typical densifier operating results obtained during a specific test, and therefore form part of a series of tests used as the basis for the curve shown in Figure 6. The paper clearly points out that Table II refers to typical results, and the authors cannot therefore accept responsibility for Dr Van der Walt's feeling that he was misled.
- It appears that Dr Van der Walt's comments are symptomatic of a situation that exists in some spheres of the coal-beneficiation industry, namely that very much attention is given to micro-detail, while holistic conclusions, which normally lead to higher rates of improvement, are not given enough attention.

  However, the authors thank Dr Van der Walt for his comments, and pledge their assistance in helping him to draw conclusions from the paper.

BRANCH News

Extractive metallurgy laboratory: Vaal Triangle Branch

SHARED LABORATORY

The established shared laboratory facilities between the Departments of Metallurgy and Chemical Engineering of the Vaal Triangle Technikon and the University of Potchefstroom are already proving to be a great success.

Following the concept of the Chamber of Mines almost three years ago, a shared laboratory facility was established at the Vaal Triangle Technikon. Facilities were made possible by funding received from the Chamber of Mines and shared equipment from the two Departments. At that time, Chris Viljoen was appointed to the newly established laboratory, after he had gained his Higher National Diploma at the Vaal Triangle Technikon while employed at Stilfontein Gold Mine. At present, he is studying for his Master's Diploma.

STUDENTS

Over a period of two years, Chris established a laboratory that can handle practical assignments for third- and fourth-year chemical- and metallurgical-engineering students from the University, and from the Technikon in ore preparation. This semester, 51 students are undertaking their practical training in the laboratory, which means that over 300 practical reports will be presented. Over the past two years, more than 700 practical reports were submitted. The practicals enable the students to become operationally familiar with equipment similar to that on the mines. The practicals include the preparation of a practical experiment and the investigation of the cause and origin of a problem.

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Jewelpark to provide spark for jewellery industry

More than 200 representatives of the South African jewellery-manufacturing and related industries gathered at Mintek in Randburg on 21st July, 1992 to attend a presentation on Jewelpark, a totally new concept geared to provide impetus to the industry.

The event, which was opened officially by Mr George Bartlett, the Minister of Mineral and Energy Affairs, is a sequel to the seminar 'Jewellery—the road ahead' organized by Mintek in 1990 in response to the Government's lifting of the *ad valorum* excise duty on local jewellery manufacture. On that occasion, the aim had been to provide an open forum with the view to initiating action programmes for the stimulation of the local industry. The latest event can be viewed as the culmination of the efforts of a number of disparate individuals and organizations over the past two years, all sharing the common motive of providing a 'kick-start' to set the industry on the road to real growth.

Jewelpark will consist of a single integrated complex, to be built at Mintek's site, comprising a jewellery training school, a 'hive' system for smaller manufacturers, large-scale manufacturing plants, and facilities that will enable jewellery manufacturers to relocate their existing operations.

Advantages for such manufacturers would include operating in a secure, parklike environment (very different from many existing operations); a safe, centralized energy supply; the savings arising from sharing of certain facilities; a comprehensive support structure, including conference and display facilities, and a secretariat; precious-metal handling, and bulk gold despatching and refining operations; group buying advantages; and affordable marketing, research, and feasibility studies.

In his presentation on the proposed training facility, educationalist Mr Pappie Moloto stressed the importance of the linking of educational and entrepreneurial skills, as well as the provision of an ideal learning environment in having 10 classes with a maximum of 25 students per class. Formal training would cover a period of two years, and the students would be exposed to the manufacturing environment at all stages. The course content would consist of personal and computerized modules, and there would be interaction with and input from Italian and German experts in the field. It is envisaged that the course could in time be extended on a countrywide basis.

Selection of potential students would be on a non-cultural, non-academic basis, the optimum age group being 24–45 years. Because of the close and dynamic environment that would exist between training and production, job opportunities would be assured.

Mintek's motivation for spearheading the development of the local jewellery industry has been the critical need for the downstream development of South Africa's mineral resources; this has become increasingly urgent in recent years. It has also been perceived that South Africa needs to refocus its approach towards its gold resources, and move away from viewing them in purely financial terms.

It is felt that, now that the political climate is right, South Africa needs both to learn from major producers such as Italy, Germany, the USA, and Japan, and to encourage these countries to expand their operations to South Africa, where both labour and raw materials abound.

Jewelpark and similar entrepreneurial ventures will provide the cement needed to reshape and rebuild the economic structure of the new South Africa, to enable it to optimize its valuable mineral and human resources.

Issued by the Information and Communications Division
Mintek
Private Bag X3015
Randburg
2125
Telephone: 709-4111
For further information contact Mrs Pat Speedie.

The current success rate of students attending the laboratory is claimed to be approximately 80 per cent. This is because most of the students have already gained some experience on the mines, and are attending the Technikon as part of a career path to higher positions. Unfortunately, the present depressed state of the gold-mining industry is having an effect on the number of students enrolling, with a decrease in students sponsored by the mines. However, this is partly offset by a marginal increase in private students. Although most of the students are white, the number of black students is growing each year.

EQUIPMENT

The present economic situation in the country has restricted funding from the Chamber of Mines for further development of the laboratory. In an effort to increase the spread of work conducted in the laboratory, Chris Viljoen asked several mining companies and manufacturers to assist by donating either funds or equipment. Iscor Pretoria, Multotec, and Mineral Deposits responded to this appeal. Donated equipment from Iscor and Multotec were rebuilt into pilot plants for heavy-medium separation and column flotation. The column-flotation pilot plant differs from those available elsewhere in that it uses a co-current column as opposed to the countercurrent column in common use.

With the existing equipment in the laboratory, project and research work can be done to raise funds for further development. Training can now also be offered via workshops and/or seminars held on or off campus in areas such as ore preparation and hydrometallurgy. Over a period of two years, projects have been conducted in the laboratory on particle size analysis, gravity concentration, cyclosizing,

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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.

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.

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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.

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.