

SPOTLIGHT

on MINTEK 50

by S. A. ALLISON*

Opening

The Conference began with registration, followed by a well-attended cocktail party on the evening of Sunday 25th, where, in a convivial atmosphere, Dr Louw Alberts, President of Mintek, welcomed the delegates and wished them an enjoyable and informative week.

The Conference was formally opened by the Minister of Mineral and Energy Affairs, the Honourable Mr D. W. Steyn, at 9h00 on Monday. Sketching the history of Mintek and its predecessors, Minister Steyn described the objective and achievements of Mintek, as well as the background to mineral-processing research in South Africa and the policy of the South African government towards the development of the mineral industry.

Dr Alberts then presented a plenary address, authored by himself and Mintek's Deputy President, Dr P. R. Jochens, entitled 'A manifesto for a metallurgical research programme in a mineral-rich country'. The authors identified, and discussed with examples, various motivating factors for a research-and-development programme, such as lower capital and operating costs, processes for still-unexploited deposits, an increase in the country's self-sufficiency, and the utilization of by-products and waste products. The authors concluded that, although these motivations and their priorities had not changed significantly in the past, changes are more likely in the future. The likely changes and the relevant time frame must be predicted more accurately to permit long-term motivation and the allocation of priorities.

Technical Sessions

Four days of technical presentations, each consisting of three parallel sessions, were held, 90 papers and 5 plenary papers being presented. A complete description of these sessions is not possible here, but the presentations are summarized below under four major headings.

Group 1: Ore-dressing

Covering the main ore-dressing areas, this group included

- optimization of ore-dressing processes and energy saving (12 papers)
- treatment of fines, tailings, and low-grade ores (8 papers)
- innovations (4 papers)
- modelling design and control (4 papers).

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A plenary paper presented by Dr A. J. Lynch, Director of the Julius Kruttschnitt Mineral Research Centre, Australia, covered recent developments in the modelling and control of mineral-processing plants.

Dr Lynch contended that, despite gaps in the existing knowledge, major progress has been made and is continuing towards the goal of comprehensive models for a range of mineral-dressing unit processes. Simulation techniques will become more widespread, but the individual and particular characteristics of each plant application will have to be recognized in the application of the general principles.

Five papers dealt with milling. These covered the scale-up from laboratory experiments to full-scale operation, measurements and descriptions of the environment within a mill, and the control of milling circuits.

Ten papers covered aspects of flotation. In a keynote paper in this group, which was presented by Professor R. R. Klimpel, Professor P. Somasundaran, Columbia University, U.S.A., described recent findings supporting the contention that the poor flotation recovery of fines is due to differences in morphological and mineralogical characteristics from those of coarse particles, rather than to the other, more usual explanation based on hydrodynamics. Of considerable interest to local metallurgists was a paper on the flotation of gold at Bougainville Copper Ltd where, for a very different feed material, the findings are similar to those observed in the flotation of tailing materials at South African gold mines.

The recent increased interest in magnetic-separation techniques was in evidence. One paper described a small apparatus for the testing of the potential of an ore for magnetic separation, and two papers covered aspects of the test and pilot-plant work at Foskor.

The treatment of ore deposits previously considered of too low a grade for viable processing was described in a paper on the bacterial heap leaching of a low-grade nickel material.

Group 2: Hydrometallurgical Process

This group included

- electrolytic processes (4 papers)
- equipment and modelling (4 papers)
- leaching processes (8 papers)
- separation processes (8 papers)
- process development (6 papers).

In his plenary paper, Dr J. E. Dutrizac, Head of the Metallurgical Chemistry Section of CANMET, Canada, examined recent advances, both in plant practice and in

fundamentals, that have occurred in the leaching of sulphides and in iron precipitation. In another plenary paper, Dr D. S. Flett, Head, Metals Extraction Division, Warren Spring Laboratory, United Kingdom, discussed developments in separation science in hydrometallurgy, describing unit processes such as ion exchange, solvent extraction, carbon adsorption, and membrane processes that have made a major impact in recent times.

Interest in the carbon-in-pulp process was evidenced by five papers that covered both the mechanism of gold adsorption onto activated carbon and plant problems and practice associated with the application of the process. These papers can be compared with three others covering the use of resins in hydrometallurgy for the extraction of gold, uranium, and other metals.

Interest in manganese was shown by four papers that dealt with aspects of the metallurgy of this metal and its oxide, and two with its recovery from a waste source.

Four papers dealt with the metallurgy of uranium, from the leaching behaviour of uranium-bearing minerals to the application of continuous ion exchange in its recovery.

Group 3: Pyrometallurgical Processing

- This group included presentations on
- modern steel processes (4 papers)
 - furnace development (2 papers)
 - plasma technology (2 papers)
 - plasma processes (4 papers)
 - plasma facilities (4 papers)
 - mineral and material science in pyrometallurgy (4 papers)
 - non-ferrous pyrometallurgy (2 papers).

The importance and current interest attached to plasma technology were shown in no fewer than 10 papers covering aspects of this topic. In his plenary lecture, Dr K. J. Reid, Professor of Mineral Engineering and Director of the Mineral Resources Research Center, University of Minnesota, U.S.A., reviewed current projects in plasma metallurgy world-wide. South African research in this field was covered by descriptions of the application of transferred-arc plasma to the melting of metal fines and of the plasma facility at Mintek.

Eight papers at the Conference dealt with aspects of the metallurgy of chromium, from its pyrometallurgy to the production of chromium chemicals.

Group 4: Measurements

- The presentations in this group featured
- applied measurements (2 papers)
 - instrumental analysis (6 papers).

In his plenary lecture, Dr R. L. Watters, National Bureau of Standards, Washington, D. C., discussed recent progress in instrumental analysis, viz atomic-absorption X-ray-fluorescence, and plasma-emission spectrometry, and their application to the analysis of metals and ores.

The papers on instrumental analyses reflected research into the applications of these techniques covering laboratory and on-line plant applications.

Two papers of different interest dealt with the corrosivity of underground mine waters and the continuous monitoring of information from the inside of a rotary mill.

Symposium on International Mineral Policy

Wednesday, the 28th of March, was devoted to a special Symposium with the above title chaired by Mr P. A. von Wielligh, a member of Mintek Council, and by Professor R. P. King, President of The South African Institute of Mining and Metallurgy. Six papers were presented by eminent overseas and South African authorities.

Sir Ronald Mason, formerly Chief Scientific Adviser to the Minister of Defence in the U.K., spoke on strategic minerals and national securities. He noted 'the near obsessional preoccupations in the West with the third industrial revolution and the emerging technologies which support it'. If realized, the new technologies would significantly change current metal usage and the pattern of strategic-supply dependence and inter-dependence. He believed that a major contribution to economic recovery would be made by defence spending.

Mr Simon D. Strauss, a Consultant on Mineral Economics in the U.S.A., discussed capital requirements, mining costs, and public opinion as they affect the mining industry. He showed that the estimates of metal demands made in the fifties were considerably below today's actual demands, but that production has kept pace with these demands. This he ascribed to the identification, development, and exploitation of mineral resources by mining companies. The capital costs of mining operations have increased significantly. He pointed to lower grades, the requirements of a more sophisticated supporting infrastructure, and the costs of equipment as the main causes. In the U.S.A., in particular, environmentalist pressure has led to significantly increased mining and production costs. In many Developing Countries, the demand has been for State control of the mining industry, and the priorities for public sector companies, controlled by politicians, are different from those for private companies. Economic motives for the maximization of efficiencies and profits are replaced by political motives such as the maintenance of foreign-exchange revenues and high employment.

Dr R. F. Lautel, Adviser to the General Manager of the Bureau de Recherches Géologiques et Minières in France and Chairman of the EEC Crest Raw Materials Subcommittee, delivered a paper entitled 'France's Mineral Policy and the EEC's Approach to Mineral Affairs', and described this as the policy of a country 'highly dependent on foreign countries with respect to raw materials'. The French target is to secure a regular and non-vulnerable supply of non-energy minerals. The State plays a very active role, and various organizations have been established to implement steps towards improving the knowledge about local French deposits: supporting the metallurgical industry, reinforcing and stimulating research and development, increasing the involvement of French companies in foreign countries, initiating cooperative programmes with producing countries, establishing a security stockpile, and developing raw-materials saving and recycling systems.

Dr Daniel I. Fine, a Research Associate at the Mining and Mineral Resources Research Institute, Massachusetts Institute of Technology, spoke on 'U.S.A. Mineral and

Materials Technology Policy: Response to Vulnerability of Dependence'. He pointed out that the 'fundamental reality of U.S. dependence upon South Africa for strategic and critical minerals' has not changed, and that the Reagan administration 'no longer assigns even the slightest probability that it could or should change'. U.S. subsidization to stimulate exploitation of otherwise uneconomic domestic strategic mineral reserves is not forthcoming, and environmentalist pressure has locked up very large areas to mining exploration. However, research-and-development and changing mineral usage, particularly in defence areas, might change conditions of dependence. The U.S.A. is planning for a three-year strategic stockpile.

Mr J. C. Hall, Executive Chairman of Middelburg Steel & Alloys (Pty) Ltd, described the uses for and factors influencing the future demand for stainless steels. His interesting and detailed paper emphasized the crippling cost and burden of corrosion in world economics, and the importance and necessity of life-cycle costing in the planning and choice of plant and equipment.

Mr D. A. Etheredge, a former Executive Director of Anglo American Corporation, spoke on the role of multinational corporations in the mineral industry. He outlined the important role played by such corporations in economic developments in the sixties and seventies. These corporations had brought more real growth to the Third World than that brought by international development aid. Over the past five years, however, their interests had shrunk owing to the general malaise in world trade, growing financial problems, and the hostile political attitude of many Developing Countries to multinationals. In South Africa the latest decentralization schemes looked as if they had a good chance of succeeding. 'It seems that the incentives are meeting their purpose of alleviating the financial problems in the early establishment years of an industry and compensating for the disadvantage of being located away from metropolitan areas'. He noted that, apart from gold and coal, South Africa's mineral wealth has now been fragmented among a number of independent States. 'There must be commonly agreed exploration and mining policies among the various South African States if there is to be orderly and wise exploitation of these orebodies'.

The closing address to the Symposium was given by Dr N. Stutterheim, the Deputy Chairman of Mintek Council.

Conference Dinner

Social highlight of the week was the Conference dinner (at the Alberton Civic Centre), which was attended by about 800 people. The guests of honour were the Prime Minister, the Honourable P. W. Botha, and Mrs Botha. Among the other guests were six Ministers and former Ministers whose portfolios had included responsibility for Mintek, and a former Director General of Mintek, Dr R. E. Robinson. The presence of five members of the Cabinet at one social gathering must be a unique event in recent history.

The main speech was given by the Prime Minister, who congratulated Mintek on its anniversary and its contribution to metallurgical science. He emphasized South

Africa's role as a trustworthy supplier of quality mineral, and the governmental action taken to assist effective exploitation of mineral resources by the private sector. The Prime Minister further noted that the close relationship existing between Mintek and the industry in South Africa is directly responsible for much of the success we have enjoyed in the field of technology'.



At the MINTEK 50 dinner, the Prime Minister, the Honourable P. W. Botha, exchanges a joke with Mrs Elsa Alberts and the Honourable Dr P. H. J. Koornhof, Minister of Cooperation and Development (at left).



MINTEK 50 delegates panning for gold at Pilgrims Rest during one of the post-conference tours.

Post-Conference Tours

The post-Conference tours included a visit to Palabora Mining Company, the Phosphate Development Corporation (Foskor), and Fairview Mine in the eastern Transvaal, with visits to the Kruger Park, the Sabie area, and the Blyde River Canyon, and an excursion to various submerged-arc furnaces in the northern and eastern Transvaal.

Conference Proceedings

MINTEK 50 was a resounding success, being both an

enjoyable and highly productive exercise and a fitting way for Mintek to celebrate its fiftieth anniversary. Metallurgists and mineral technologists in this and other countries will have a further valuable source of up-to-date reference material in the many papers presented, which will be available in the Proceedings of the Conference.

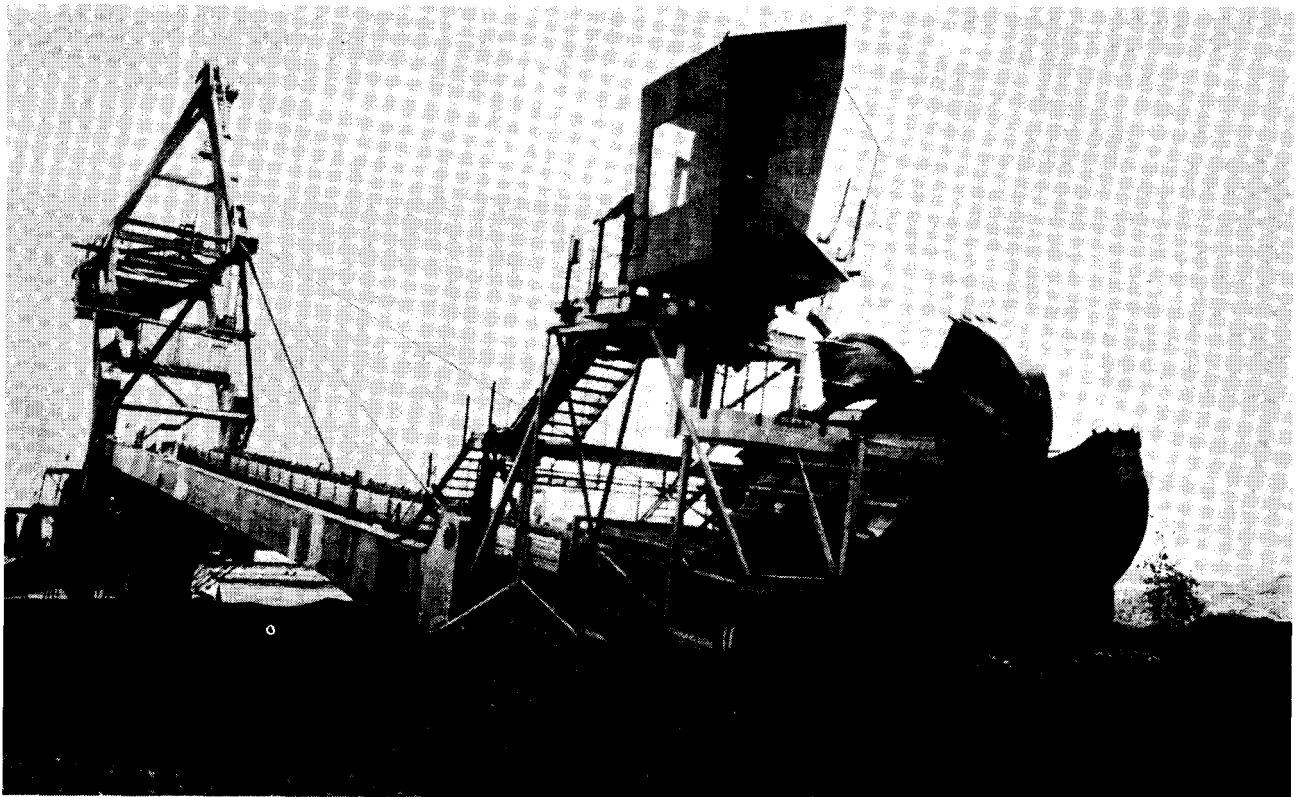
To quote a leading researcher from Australia, 'MINTEK 50 can be regarded as an important milestone on the road of progress in mineral science and technology'.

1984 Awards

The 1984 Projects and Systems Awards of The South African Institute of Mechanical Engineers included awards to Richards Bay Coal Terminal, Phase III, and to the pilot plant at Ucor for the enrichment of uranium.

At an annual export capacity of 24 Mt, the Richards Bay Coal Terminal is one of the largest in the world. The Phase III expansion has now made it possible for 44 Mt of coal to be exported annually from Richards Bay. The terminal far outstrips any other terminal in volume-handling capacity, and is in a leading position in the world with regard to the related technological development.

The process for the enrichment of uranium developed by Ucor involved a novel approach, and the engineering problems encountered demanded the highest degree of technical and engineering ingenuity. They proved to be an important stimulus to the country's precision manufacturing industries since most of the components were manufactured locally. Further refinement of the successful Ucor process entailed the design and development of a special axial-flow compressor, which, like the pilot plant, is a major engineering achievement.



Part of the Richards Bay Coal Terminal, Phase III development