

Books

1. Book reviews

- *Mine investment analysis*, by D.W. Gentry and T.J. O'Neil. Society of Mining Engineers (Caller No. D, Littleton, CO 80127, U.S.A.). US\$50.

Reviewer: D.G. Krige

This is a good basic textbook on mine investment analysis for academics and practitioners involved in this field. It covers all the basic concepts, criteria, and procedures essential in any such analysis, touches briefly on risk analysis, and includes a typical U.S. case study.

- *Finance for the mineral industry*, by C.R. Tinsley, M.E. Emerson, and W.D. Eppler. Society of Mining Engineers (Caller No. D, Littleton, CO 80127, U.S.A.). US\$50.

Reviewer: D.G. Krige

This book comprises a collection of 95 papers grouped into 12 chapters. These cover the financial requirements and structures of mining companies, financial evaluation and accounting, taxation, profit and economic rent, overseas operating agreements, financial planning and management, risk analysis, information requirements, funding, and thirteen case studies.

Although most of the papers are by authors from the U.S.A., a substantial number are by authors from Canada, the U.K., and Australia. The coverage of the book is extensive in all critical aspects of financing for the mineral industries and is a worth-while reference volume for workers in this field.

2. Mintek reports

The following reports are available from the Council for Mineral Technology, Private Bag X3015, Randburg, 2125 South Africa. They are free of charge to South African addressees, but there is a handling charge of US\$25 per copy for reports sent to overseas destinations.

● Report M291D

Removal of pebbles and pre-crushing of selected feed material in autogenous milling, by D.I. Hoyer. First issued Nov. 1986, reissued Apr. 1988. 16 pp.

Two methods by which the standard autogenous-milling process can be modified are reported, viz the removal of the pebbles in the size range 25 to 60 mm during milling, and the pre-crushing of a fraction of the feed material. The tests were conducted in the pilot autogenous mill at Mintek, using a uranium ore from Beisa.

The removal of pebbles during autogenous milling appears to have several advantages. The energy requirements are reduced, the throughput is increased and, in industrial operations, the downstream handling costs would be reduced because barren pebbles are rejected at the milling stage. The testwork showed that approximately 80 per cent of the pebbles removed from the mill were

barren, and that the crushing and recycling of the remaining 20 per cent did not have a major influence on the milling process.

Pre-crushing of the feed material in the size range between 13,5 and 76 mm to smaller than 13,5 mm was also investigated. Tests in which a hydrocyclone classifier was used in attempts to produce a fine product (90 per cent smaller than 75 μm) from the modified feed were unsuccessful owing to a large build-up of sand in the mill, which caused intermittent blockage of the peripheral-discharge grates. In some tests, a 1,2 mm screen was used as the classifier to give a coarser product, and these were more successful, resulting in an increase in the throughput of the pilot autogenous mill of 130 per cent. However, when the modified feed was fed to the mill, the size distribution of the load in the mill changed, and the product obtained was coarser than the product from run-of-mine ore—25 per cent as against 51 per cent smaller than 75 μm .

● Report M350

A survey of milling and mill-lining practice on South African gold mines, by M.S. Powell. Jun. 1988. 30 pp.

This report presents an analysis of the results of a survey of milling and mill-lining practice on South African gold mines. Questionnaires were sent to 53 active reduction plants, and replies were received from all of them.

Ball-milling circuits, consisting of primary ball mills followed by secondary pebble mills, account for 35 per cent of the gold ore that is reduced. Run-of-mine (ROM) mills and rod-milling circuits process 28 and 18 per cent of all the gold ore milled respectively. Pebble mills are the most widely used type of mill, making up almost 60 per cent of the total number of mills.

The average energy drawn, including the average energy used in crushing, is similar for the different types of circuits. ROM and pebble-mill circuits use about 5 per cent more energy than the average, while circuits with primary composite mills and rod-mill circuits use 9 and 5 per cent less respectively.

The consumption of balls by ball and ROM mills is almost 1 kg per ton of new feed, whereas the consumption of grinding media in rod and composite mills is about 0,5 kg/t. The consumption of balls by ROM mills is high, although they contain low charges of balls.

Because the Physical Metallurgy Division of Mintek is particularly interested in matters pertaining to mill liners, the results of that section of the survey were analysed in detail. White iron and austenitic manganese steel (AMS) are the principal materials of liner construction, and liners of these materials constitute 93 per cent of all mill liners. In general, white iron is used in the construction of thick, solid blocks, and is not used in mills of very large diameter. AMS is used mainly in grid or Osborne-bar liners, and dominates the lining of large mills, particularly ROM mills. However, white-iron blocks protected by lifter bars were recently re-introduced into some ROM mills. It is also of interest to note that solid AMS blocks are used in an appreciable number of rod and ball mills of less than 2,7 m diameter.

A comparison of the rates of wear of different types of liners shows that Osborne bars have the highest, and

grids the lowest, rate of loss in mass. The wear rate of white iron is about twice as high as that of AMS. Lifter bars appear to increase the life of linings by about 60 per cent.

The results of this survey allow the efficiency, cost, and usage of different milling and mill-lining practices to be compared, and the most efficient and cost-effective methods of reduction to be identified.

● **Report M356**

The distribution of cobalt in mineral constituents of the Merensky Reef and UG-2 Chromitite Layer of the Bushveld Complex, by G. Smits. Jul. 1988. 13 pp.

Trace amounts of cobalt are incorporated in almost all the constituents of the Merensky Reef and the UG-2 Chromitite Layer of the Rustenburg Layered Suite in the Bushveld Complex.

Although the cobalt concentration in silicates and chromites is low, ranging up to 800 and 700 p.p.m. respectively, the proportion hosted by these minerals is large because they are the predominant constituents of the rock. In the Merensky Reef, the silicates are major constituents, so the bulk of the cobalt is present in them; in the chromite-rich UG-2 layer, the major proportion is present in chromite.

Only the cobalt that is locked up in sulphides can be extracted during beneficiation of the platinum-group minerals and, because the sulphide content of the reefs is very low, the total amount of cobalt that can be recovered is also low.

● **Report M359**

The development of a mobile laboratory for the monitoring of gold and cyanide in alkaline cyanide solutions, by R.V.D. Robért, C. Pohlandt-Watson, H.J. du Plessis, and G.D. Marshall. Aug. 1988. 17 pp.

A description is given of the analytical methods that are used, and of the instrumentation that is housed, in a mobile laboratory for the *in situ* monitoring of gold and free cyanide in plant process solutions resulting from the extraction and recovery of gold. The gold is measured by atomic-absorption spectrophotometry using electrothermal atomization, and ionic cyanide is measured by a simplified flow-injection technique. Both analysers are capable of automatic operation on line, provide accurate and precise results, and require a minimum of maintenance. The measurement range for gold is between 0,002 and 5,0 mg/l, and that for cyanide between 20 and 1000 mg/l.

Productivity and technology

The Metallurgical Society and Gesellschaft Deutscher Metallhütten-und-Bergleute are sponsoring the Symposium on Productivity and Technology in the Metallurgical Industries, which is to be held in Cologne, West Germany, from 17th to 22nd September, 1989. This International Conference will consist of plenary lectures, technical sessions, technical field trips, and social functions.

The following Cooperating Societies are helping to promote this symposium: The Mining and Metallurgical Institute of Japan, The Metallurgical Society of CIM, The Society of Mining Engineers, The Australasian Institute of Mining and Metallurgy, and Benelux Métallurgie.

This International Conference will address the practical application of emerging concepts aimed at improving both productivity and technology in the primary and secondary metal industries. A major goal of the Conference is to promote cross-fertilization of ideas among the various commodity-based industries. This will be accomplished by providing a forum for assessing, from a variety of international perspectives, the capability of current and emerging technology to meet future challenges in increasing productivity, changing market conditions, and environmental requirements.

Metal industries covered by this conference include copper, nickel, lead, zinc, tin, their byproduct metals, light/reactive metals, aluminium, and precious metals.

Oral presentations at the meeting may be given in either English or German. Simultaneous translation (German to English) will be provided at the meeting.

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Non-ferrous smelting

Commemorating a centenary of lead smelting and refining at Port Pirie, the Conference on Non-ferrous smelting will be held at Port Pirie from 17th to 20th September, 1989.

The Port Pirie works of The Broken Hill Associated Smelters Pty Ltd operates the following:

- (i) a lead smelter/refinery capable of producing over 200 000 t of refined lead per annum,
- (ii) a slag-fuming and electrolytic-zinc plant capable of producing 40 000 t of zinc metal from lead blast-furnace slag per annum, and
- (iii) a copper-leaching/electrowinning plant capable of producing 4000 t of cathode copper from lead-copper matte per annum.

Papers presenting aspects of research, operating, and environmental practices in the fields of lead, zinc, and copper extractive metallurgy and associated areas of by-product treatment are invited.

Port Pirie is located on the eastern shore of Spencer Gulf approximately 240 km north of Adelaide, the capital city of the state of South Australia. The city developed initially as a port for shipping agricultural products. However, with the development of the Broken Hill, NSW, lead-silver mines, the city rapidly became the port of entry for mining supplies and the port of export for mine products. The commencement of lead smelting and refining operations in 1889 led to the development of the

city as a major industrial centre.

The conference programme includes an inspection of the Port Pirie works of The Broken Hill Associated Smelters. Post-conference tours of the copper mining and smelting operations at Olympic Dam (Roxby Downs) and steel-making operations of BHP at Whyalla are also included in the programme. An extended tour of selected non-ferrous smelting operations in Australia will be arranged for overseas delegates should there be sufficient expression of interest.

Papers to be presented at the Conference will be published as a volume in the Symposia Series of The Australasian Institute of Mining and Metallurgy.

The Conference is being organized under the auspices of The Institute of Mining and Metallurgy by the Port Pirie Combined Group (Aus.I.M.M.—I.E. Aust.).

For further information contact the following.

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International trade fairs

From 20th to 26th May, 1989, 4 major international trade fairs will be held in Düsseldorf, West Germany. These will present capital goods for the foundry, metallurgical, coal, and iron and steel industries.

The trade fairs are as follows:

GIFA 89
7th International Foundry Trade Fair and 56th World Foundry Congress

METEC 89
3rd International Exhibition for Metallurgical Technology and Equipment, with Congress

THERMPROCESS 89
5th International Exhibition for Industrial Furnaces and

Thermic Production Processes
BERGBAU 89
International Mining Exhibition.

This combination is unique in the international trade fair scene, each of these fairs being of major international importance.

South Africa will participate officially, and there is still space available. For more details, please contact the Department of Trade and Industry in Pretoria (Export Trade Promotion, Mr D.A. Terblanche, Tel: (012) 322-7333) or the South African-German Chamber of Commerce and Industry Ltd as the official representatives for Düsseldorf Fairs.