

Book news

1. Book reviews

- *Rock mechanics design in mining and tunnelling*, by Z.T. Bieniawski. Rotterdam, Balkema, 1986. Hfl. 105.

Reviewer: G.S. Esterhuizen

The emphasis of the book is on the process of *engineering design* in rock and its application in mining and civil engineering tunnelling.

The first chapters provide an interesting historical review of mining and tunnelling achievements, followed by a discussion of design methodologies, contracting, and project management. The stages of design are described in the next chapters, starting with the gathering of the input data for design. The emphasis is on the properties of the rock mass and methods of determining these properties in the field.

Empirical methods of design are discussed, covering mainly the various rock-mass classification methods. Each method is presented, together with comments on its origin, areas of application, and a practical example. The support recommendations that go with the classification methods are also given.

Observational methods of design are dealt with next, the New Austrian Tunnelling method being discussed in some detail. The principles of monitoring and some of the techniques are discussed.

Numerical and physical modelling are considered briefly in the chapter on analytical methods of design, leading to failure criteria, where rock material and rock mass failure are discussed. The section ends with the important topic of the validation of models.

Combinations of the above design methods are presented in a chapter on integrated design. The design of coal-mine pillars is dealt with in some detail, and the methods employed in different countries are compared and evaluated. The chapter closes with a list of steps to be followed in the design of pillars for a new mine.

Finally, three examples of 'guided design' are given from the fields of civil-engineering tunnelling, hard-rock mining, and coal mining. The various design procedures are worked through, and reasons for the recommendation of a specific type of support are given.

Each chapter in the book is referenced, and there is also a comprehensive author and subject index.

The book gives a good review of the problems associated with design in rock and the currently available methods of design, showing that there is often more than one 'correct' solution to a given problem. The design of tunnel-type excavations is treated comprehensively, but there is little to assist the designer of large temporary excavations such as producing stopes in mines. The book will be of great value to anyone involved in the design of civil tunnels or mining excavations.

- *Fundamentals of solidification*, by W. Kurz and D.J. Fisher. Aedermannsdorf (Switzerland), Trans Tech Publications, 1986. US\$ 24,00.

Reviewer: J.P. Hoffmann

The book starts with a comprehensive glossary of sym-

bols and units used in the text, and is followed by an introductory chapter in which the author gives an overview of the importance of solidification, heat extraction during solidification, and solidification structures.

Chapter 2 discusses atom transfer at the solid-liquid interface, including the conditions for nucleation, the rate of nucleus formation, and the interface structure. Diagrams and equations are used to illustrate each concept.

In the third chapter, which deals with the morphological instability of the solid-liquid interface, the evolution of an unstable or stable interface is described for both pure substances and alloys. The conditions for constitutional undercooling and the resultant structures are illustrated mathematically and are amply supported by line diagrams.

In two chapters on solidification microstructures, the author discusses the morphology and crystallography of dendrites. The behaviour of the dendrite tip is examined, and the role played by diffusion is described in detail. Primary spacing of dendrites after directional growth, and secondary spacing after directional or equiaxed growth, are explained by the use of excellent diagrams. The growth of eutectic structures is then described coupled with diffusion, interface concentration, and temperature. Although dendrites make up the bulk of the microstructures of most alloys, a number of important eutectic alloys are found in practice. Eutectic structures are characterized by the simultaneous growth of two (or more) phases from the liquid.

The last chapter deals with the subject of solute redistribution. First, segregation with complete liquid mixing and some solid-state diffusion is analysed, and then a brief analysis of microsegregation is given.

Ten appendices describe the mathematics of solidification in detail, including the derivation of most of the equations given in the previous text.

Each chapter ends with a number of exercises, and a solution manual is available from the publishers. References are given after every chapter, as well as after every appendix. These will assist the reader in studying any aspect of solidification in detail.

Because of the highly specialized subject matter and the highly theoretical way in which the book is presented, it will find a very limited number of readers. It is a book mainly for lecturers and students in metallurgy or metallurgical engineering.

2. Recent publications

- *Canadian mines handbook 1986-87*. Toronto, Northern Miner Press, 1986. 502 pp. \$29 (paperback), \$32 (leatherette).

This handbook has been published annually since 1931. This year's edition includes over 2200 companies actively involved in the exploration for minerals and their development and production. In an industry where change is constant, the 1986-87 edition is an easy-to-use, informative guide to each corporation and its present status. This company-by-company directory contains an abundance of information including addresses, telephone numbers, key personnel, share capital, properties, joint-venture agreements, ore reserves, production figures, and financial status. Changes in mine personnel, refineries

and smelters, government departments, securities commissions, and trade, mining, and professional associations are duly noted in independent sections. The map section includes maps of producing and exploration areas with an up-to-date version of the exciting Casa Berardi area in Quebec.

● *Canadian mines: Perspective from 1985*. Canada, Mineral Policy Sector, 1986. \$7.20. (Obtainable from Printing and Publishing, Supply and Services Canada, Hull, Quebec K1A 0S9, Canada.)

This bulletin reports on the results of a joint federal and provincial undertaking aimed at monitoring, on an annual basis, the supply systems for the most important mineral commodities being mined in Canada. Concise overviews are presented of the Canadian reserves situation, of the supply capability on the basis of current reserves alone, of recent commitments for bringing new mines on-stream, and of the level of exploration and discovery.

● *Anniversary book*. Allentown, U.S.A. (Government Building, PA 18103, telephone (215) 266-1570), 1986. 52 pp. Free of charge.

In honour of their first decade, the IPMI has published a special book highlighting the history, accomplishments, and awards of the Institute over the past ten years. The book was prepared in conjunction with IPMI's Tenth International Precious Metals Conference and Exhibition which was held at Lake Tahoe, U.S.A.

3. Mintek publications

The following publications are available free of charge from the Council for Mineral Technology, Private Bag X3015, Randburg, 2125 South Africa.

● **Special Publication 7**

A manual of analytical methods used at Mintek, by H. Stoch. 1986. 432 pp.

This manual updates *Special Publication No. 4*, which was published in 1983. It contains approximately 280 methods of analysis of which 50 are new, but is by no means complete, since it includes only those methods that were investigated in some detail and have been published as unrestricted or restricted reports.

Approximately another 400 methods, although recorded in the Analytical Science Division, have not been published. They are therefore not listed in this manual and are not available to external laboratories.

● **Report M272**

The determination of silica in water by flow-injection analysis, by E.A. Jones.

Methods using flow-injection analysis are described for the spectrophotometric determination of silica based on the formation of the molybdosilicic acid (yellow method) and a heteropoly blue complex (blue method). Silica in the concentration ranges 0,1 to 10 mg/l and 0,5 to 10 mg/l can be determined at a maximum sampling rate of 75 and 85 samples per hour respectively. The blue method uses ascorbic acid to reduce the yellow molybdosilicic acid to

the heteropoly blue complex. The physical parameters of coil length, flowrate, sample size, and temperature were optimized by use of a modified simplex method. The procedures are applicable to the determination of silica in water.

● **Report M273**

The use of the Flotaire column cell in the beneficiation of a coarse copper sulphide ore, by R.S. Fickling. Sep. 1986. 11 pp.

Preliminary testwork on the Flotaire column cell indicated that it can be used successfully for the beneficiation of coarse (larger than 212 μm) deslimed ores. However, because no work was carried out on finer material, no conclusions can be drawn as to its efficiency in the treatment of fine ores.

Columns of 50 and 160 mm diameter were tested, and the results show that, although the small column can be used, it requires major modifications before successful steady-state operation can be achieved. The 160 mm column operated with ease and yielded consistently high recoveries and concentrate grades.

● **Report M274**

Mineralogical aspects of the bacterial leaching of auriferous sulphide concentrates, and a mathematical model for the release of gold, by M.J. Southwood. Oct. 1986. 18 pp.

Bacterial leaching for the recovery of refractory gold from sulphide concentrates depends largely upon the mineralogical suitability of the substrate. The susceptibility of sulphide minerals to bio-oxidation is discussed in terms of their trace-element chemistry, crystal structure, physical form, and mineral intergrowths. A mathematical model is derived to describe the relationship between the breakdown of sulphide and the release of gold. The rate of release of gold can be considerably enhanced where the precious metal is concentrated in structural defects in the sulphides, because these defects are sites of preferred bacterial corrosion.

● **Report M275**

A simplified flow-injection method for the determination of free cyanide in process solutions, by C. Pohlandt-Watson. Sep. 1986. 9 pp.

A description is given of a simplified flow-injection technique that is suitable for the on-line determination of ionic cyanide in process solutions. The method makes use of a single buffered carrier stream and a detector with an ion-selective electrode. The proposed method significantly reduces the response of the ion-selective electrode to metal cyanide complexes. This improves the accuracy of the analyses for the available ionic cyanide in a process stream. The method is applicable to process solutions containing cyanide in the range 20 to 1000 $\text{mg}\cdot\text{l}^{-1}$. Sixty samples can be analysed in an hour, with a relative standard deviation of 0,012 at the 100 $\text{mg}\cdot\text{l}^{-1}$ level.

The effect of metal cyanide complexes on sulphur-containing interferents is discussed in detail. The method can easily be automated for use in the on-line control and operation of cyanide-leaching plants.

Shot peening

The Third International Conference on Shot Peening, which is to be held in Garmisch-Partenkirchen from 12th to 16th October, 1987, should once again provide delegates from all over the world with a comprehensive overview of the current state of knowledge, research, and technical applications in the entire field of shot peening.

The themes of the conference are

- Basic aspects of shot peening
- Technology of shot peening
- New applications of shot peening
- Quality assurance by control of the peening process and of the peened material
- Economic aspects of shot peening
- Changes in the state of the material by shot peening
- Improvements of the behaviour of materials and construction components: fatigue strength, behaviour under fretting corrosion, stress-corrosion cracking, rolling contact, and wear conditions
- Consideration of material changes in design and strength calculations

- Shot-peening forming
- Simulation and optimization of the effects of shot peening by means of computing processes
- Modelling of the shot peening process and its effects.

The Conference languages will be English and German. Both oral presentation (15 minutes plus 5 minutes discussion) and poster presentation will be provided. Those who wish to present papers should submit to the address below an abstract in typescript suitable for photocopying (one page 16 × 24 cm, beginning with the title, the author's name and location, including figures and tables) by 1st June, 1986.

Conference Secretariat
Deutsche Gesellschaft für Metallkunde e.V.
Adenauerallee 21
D-6370 Oberursel
West Germany.
Telephone 06171/4081.

Offshore separation processes

The International Conference on Offshore Separation Processes, which is to be held in Edinburgh from 14th to 16th October, 1987, is to be organized and sponsored by BHRA, The Fluid Engineering Centre.

The gathering of total well fluids and the subsequent use of multi-phase systems offers a range of production possibilities that could reduce both transmission costs and platform weight. Floating platforms, which are necessary for deep-water production, could well affect separation performance. To achieve the economic exploitation of multi-phase systems and deep-water and marginal fields, greater understanding of the multi-phase behaviour of phase-separation equipment is necessary. In its own work, BHRA has shown that separator design and efficiency can be improved substantially, thereby reducing capital costs, increasing throughput, and improving product quality. Operators, designers, engineers, and researchers need to exchange experiences and results to ensure that the oil and gas industries can gain maximum benefit from current and future research. This meeting is designed to allow practical engineers and researchers to discuss case histories, current practice, and new developments.

The Conference will deal with all aspects of the design of topsides-process equipment, including physical modelling, mathematical modelling, and practical operating experience. Particular emphasis will be placed on the design and operation of gas-liquid and liquid-liquid separation equipment. Relevant papers dealing with other aspects of the technology of topsides processes will also be considered.

The following are subject areas of particular interest:

- operational experience of separation and process equipment on floating production facilities and subsea installations,
- prediction of process-equipment performance and comparison with field data

- mathematical modelling and computer-aided design of topsides-process facilities
- innovative designs of separation and process equipment for floating or subsea operation
- instrumentation and control of process equipment under transient operating conditions arising from feed variations, plant upset, failure, or loss of containment
- advances in the design of produced water clean-up systems
- design of compact 'minimum facilities' production systems by reducing the size and weight of individual items of equipment and of the overall process train.

Authors are invited to submit titles and synopses of papers appropriate to the subject and scope of the Conference, to reach BHRA as soon as possible and not later than 20th October, 1986. Completed manuscripts, having a text of 3000 to 5000 words will be required by 9th March, 1987. All offers of papers will be considered by the Organizing Committee, but acceptance for the Conference will depend on the Committee's decision based on the contents of the final manuscript and subject to its receipt by 9th March, 1987 at the latest.

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