feasibility report which included the optimum flow sheet, design criteria, estimated capital and operating costs, production and revenue estimates and the financial assessment.

The project was split into two logical parts, one to be handled by General Mining and the second by a single contractor. A comprehensive enquiry document was sent to ten local and international companies. The tenders were evaluated on company and senior personnel ratings, management cost and fees, guarantees and possible bonus/penalty contract. The final contract was on a cost-reimbursable plus management fee basis with a bonus/penalty clause on time and price restricted to the management fee.

General Mining and the contractor formed a strong project team which expedited approval of designs and facilitated rapid decision making. Other features which contributed to the successful completion of the project were the use of senior staff and key personnel from inception to completion, who then moved to plant management and operations. Early recruitment and training of staff resulting in trained operators being available when hot commissioning commenced.

Elandsrand Gold Mine

The final paper, on "The Planning and Management in the Construction of the Elandsrand Gold Mine", was presented by Cyril Heever of Elandsrand Gold Mining Company Limited. In an interesting presentation, he did not keep to the text of his long paper but highlighted a few aspects. Apart from giving examples of the innovative changes incorporated into the project as it proceeded, he stressed the importance of rapid decision making at a period of a mine's life when time really is money. This requires a special management structure which should be shorter and different from that of a producing mine. He also felt that as project management was very different to mine (production) management, different types of people are needed for the two jobs. This was in direct contrast to the approach of the Coal Division of General Mining where staff are exposed to both management aspects as part of their promotional route.

Panel Discussion

The lively panel discussion which followed centred mainly on the differences between the different types of contracts for projects with the feeling being generally against bonus/penalty clauses and whether a different type of person is necessary for projects. In the discussion on computers it was stressed that their use provides the time for extra calculations which cannot be done by hand.

The day closed with a cocktail party sponsored by E. L. Bateman Engineering (Minerals) Limited and Control Data Corporation (Pty) Limited.

Book reviews

●*Specifile compendium '80. Mining and engineering.* (Obtainable from Specifile, P.O. Box 7870, Johannesburg 2000.)

Reviewer: J. D. Austin

In this compendium, products and services for mining and engineering are divided into 16 main sections. As an aid to the user who wants to find a particular section quickly, there are, firstly, an abridged version of the Mines Stores List cross-referencing the stores code number with the page number in the compendium and, secondly, an index giving an alphabetical listing of mining and engineering products and materials.

In the 16 main sections, the companies are listed alphabetically for each product, manufacturer, or supplier. Sixteen separate sub-sections give illustrated product descriptions.

The last part of the compendium gives an alphabetical list of companies with addresses, telephone numbers, and products. The products are cross-referenced to the pages in which they appear.

This compendium is an invaluable reference, and has 3000 trade names, 1100 suppliers' addresses, 18 000 classified listings, and 314 pages of product information.

● SKF Steel. *Plasmasmelt information brochure.* Hofors (Sweden), SKF Steel, 1980.

Reviewer: N. A. Barcza

This brochure deals with developments in plasma technology for sponge iron (Plasmared) and pig iron (Plasmasmelt).

The information section of SKF Steel has produced a technical brochure on their company's latest breakthroughs. Two processes are covered: direct reduction of iron to make sponge, and blast-furnace production of pig iron. The common denominator is plasma.

Plasmared is based on the use of a plasma torch to replace the electrically heated gas reformer that uses coke at the Wilberg–Söderfors plant in Sweden. The advantages of the plasma reformer over the now uneconomic coke resistance gas reformer system are, firstly, flexibility in the use of recarbonizing agents (namely coal fines, heavy hydrocarbons, fuel oil, and natural gas) instead of only metallurgical coke, and, secondly, improved efficiency in reforming. The drawback of this direct-reduction process is the hot-gas fan needed to circulate the off-take gas from the reduction shaft furnace to the gas reformer.

The Plasmasmelt process is based on the use of a plasma torch to replace the conventional blast-furnace tuyère, thus supplementing the thermal energy with electrical energy. Coke of inferior metallurgical quality can be fed into the top of the furnace, while fine pre-reduced iron from a two-stage fluidized bed is fed together with lime to control the slag formation and to effect desulphurization via the plasma tuyère.

Small-scale pilot-plant tests were carried out with considerable success and were completed during 1979. A larger plant is currently under construction.

These modifications to two existing processes warrant serious attention since, for the first time, plasma technology is starting to make its presence felt in the field of iron and steel in a realistic manner. However, these processes are at a relatively early stage of development and still require testing on a large scale. The potential for the use of this technology in South Africa should be seriously examined, and this brochure gives a good review of the state of the art at SKF in Sweden.

POTENTIAL VALUE OF COLLIERY DISCARD MATERIAL

By R B MacGillivray, Pr Eng, BSc(Eng) Rand, C Eng (Fellow)

Preprints of perhaps the most thought-provoking of the papers delivered at the Witbank Coal Colloquium — 'Potential value of colliery discard material' by Roy MacGillivray of Rand Mines — are available on request from the South African Institute of Mining and Metallurgy. Mr MacGillivray outlines an imaginative plan to utilize the annual nine million tons of colliery discard in the Witbank-Bethal areas.

He envisages members of various colliery groups and Escom setting up a research and study plan to investigate the viability, and the practical and economical feasibility, of interconnecting some 23 mines by conveyors terminating at a central power station. Mr MacGillivray estimates that if the energy contained in the discard material, which averages a calorific value of about 14 MJ/kg, could be utilized in this way, it would fuel an 1830 MW power station.

Colliery group members in the scheme would have to guarantee a minimum life for their participating collieries to ensure an adequate and continuous supply to the power station.

The capital costs of conveyors and road/rail/river crossings would be about R56 million and absolute co-operation would be essential for the estimated revenue of R40 million per annum that the MacGillivray scenario predicts, to be realised.

The MacGillivray proposal is that these capital costs should be financed by individual collieries, and that Escom should finance and operate the central power station in the same manner as conventional power stations. The calculated return on the capital invested for each mine would vary, but would average 108 per cent.

Discard material, not currently saleable, represents a cost to the colliery operator, for the material must be stacked and most dumps are on fire as land surface dumps of this material contain carbon and volatile matter and are liable to spontaneous combustion. Furthermore very little control can be exercised over pollution of the atmosphere by collieries as the discard material contains large amounts of sulphur which, when burned, is released into the atmosphere in the form of sulphur dioxide. The dumps are unsightly, and continuous care must be taken to prevent pollution of the surface streams with acid water or fine coal. It is important that groups should co-operate so that all mines, both large and small, are included in the scheme to overcome the pollution problem.

Stacking to prevent discard material from burning requires the discard to be crushed, spread in layers and compacted. This is costly and there is always the danger that it could ignite. Utilization of the carbon and volatile matter content prior to stacking for power generation, gasification or liquification suggests a most advantageous alternative and should provide a satisfactory return on the necessary capital investment. The resulting ash, if recycled in one or more of the many ways that have been suggested, would complete the process of economic utilization.

While a small power generation plant designed to burn discard material could be erected at each colliery, MacGillivray points out that any power generated in excess of the colliery's requirements would have to be fed into the national grid. Rationalization of such a scheme from Escom's point of view, would be to have only 1, 2 or 3 large power stations feeding into the grid.

The economic feasibility of supplying such a large power station centrally situated in the Witbank district, is described in Mr MacGillivray's paper. Gasification and liquifaction of colliery discard material may be possible, but as the economics have not been studied a concerted effort by the coal industry should be directed at such research.

POWER STATION SCHEME

As outlined by Mr MacGillivray, it would be possible to erect a small electrical power generator using a fluidized bed boiler at each colliery. The capital cost to each colilery would be considerable and a sufficiently large purified water supply would be required.

The responsibility of the coal mining industry therefore would be to deliver discard material to a central power station at an acceptable price. Escom would finance the erection of the station in the same way as it does other large stations.

If the station is to burn 8,7 million tons of discard per annum, the total revenue that would be earned by the mining industry in Witbank would be about R40 million per annum and this would provide a possible power output of 1 189 MW.

In his paper Mr MacGillivray shows:

- the sizes of conveyor belts to be used with respective capacities coupled to 20 degree troughing idlers, the speed of the belt being 2,5 metres per second with a bulk density of material of 0,80 tons/m^3;
- the cost per metre inclusive of steelwork, idlers, mechanicals, electrical drives and conveyor belting;
- the collieries' estimated discard in tons per annum;
- the estimated calorific value of the discard and the revenue based on the formula

$$\text{Revenue per ton (R)} = \frac{8{,}46 \times CV}{26}$$

where CV = calorific value in MJ/kg;

- the length of each conveyor making up a network, the tons conveyed per hour on each portion of the route, the size of the conveyor and capital cost;
- the numbers of roads, railway lines, streams and rivers crossed and estimated capital costs of these crossings.

Mr MacGillivray has also included:

- the estimated costs of extra bins and crushers required on each network and
- the total capital cost, and
- the return on capital invested, calculated for each colliery.

Furthermore, the capital cost for each mine has been built up, and a return of profit before tax on capital expenditure is demonstrated. All collieries, with one exception, show a very good return on capital.

The average return of profit before tax on capital investment is in fact 108 per cent. However, it should be remembered that under the circumstances proposed, the discard material could be considered a by-product and some of the cost of mining might be allocated to it. The total cost of servitudes is unlikely to exceed R100 000.

FLUIDIZED BED BOILERS

The whole MacGillivray exercise is based on the assumption that the discard material can be burned successfully in fluidized bed boilers. The scheme could therefore reduce pollution, for if dolomite is used in the fluidized bed, up to 90 per cent of the sulphur can be removed.

CONCLUSIONS

In his paper Mr MacGillivray ably demonstrates that current colliery discard material is capable of producing about 1 200 MW of electrical energy and that this can be done economically. Therefore to ensure the economic utilization of all colliery discard material, colliery groups should co-operate to develop an industry plan that could prove South African colliery discard materials can be successfully used in fluidized bed boilers and that these boilers can be built of a sufficient commercial size for a power station.

Two SAIMM colloquia

The South African Institute of Mining and Metallurgy (SAIMM) is organizing two one-day colloquia in the State Pavilion, Milner Park showgrounds, Johannesburg, to co-incide with the Electra Mining Exhibition on 16th and 17th September. Over a million rands worth of equipment will be on display, the Electra Mining Exhibition being rated among the four or five largest in the world. The 1978 Electra Mining Exhibition was attended by 24 000 visitors.

The colloquia held by the Institute are widely recognized as valuable opportunities for members of the Institute and other interested parties to acquire up-to-date technical information.

The programme on 'Project Management in the Metallurgical Industry' on Tuesday, 16th September, will be of interest to all involved in the design, construction, and commissioning of metallurgical plants for the mining and mineral-processing industry, either as clients or contractors, while the 'Mine Fires' programme on Wednesday, 17th September, will reflect the importance of research into mine fires in Southern Africa. The programmes allow time for those attending the colloquia to view the exhibits.

The registration fee entitles delegates to attend the colloquium of their choice, luncheon, and cocktail party, and to receive a copy of the preprints. The fees for each colloquium are as follows:

Project Management in the Metallurgical Industry

R30 for members of SAIMM.

R45 for non-members.

An extra R15 for late registration.

Mine Fires

R20 for members of SAIMM.

R30 for non-members.

Company Affiliates may send two non-members at membership rates.

If you wish to attend the colloquia, write to The Secretary, South African Institute of Mining and Metallurgy, P.O. Box 61019, Marshalltown. 2107.

The technical programmes are as follows.

Project Management in the Metallurgical Industry
16th September 1980

Overview of project management for metallurgical plants, by J. D. Koch (Engineering Management Services Ltd).

Project control, by R. J. Knott and E. R. Davis (Engineering Management Services Ltd).

The project commissioning phase, by K. Levin (Engineering Management Services Ltd).

Client requirements in contracting (do's and dont's), by L. L. Mostert (Edward L. Bateman Ltd).

The reimbursable project management contract, by F. van Heerden (Edward L. Bateman Ltd).

Planning and project management for Iscor's Grootgeluk coal mining project, by B. C. Alberts and other members of the project team (Iscor Ltd).

Recent experience in the management of metallurgical projects in the South African gold mining industry, by a panel of speakers representing mining houses.

Panel discussion and conclusion, chaired by J. I. Fox-Smith (Mitchell Cotts Projects (Pty) Ltd).

Mine Fires
17th September 1980

Research into fire fighting and fire prevention, by A. Whillier and J. D. Greig (Chamber of Mines Research Laboratories).

Insurance aspects of mine fires, by Messrs Mansfield and Russo (Glenvaal Insurance Brokers).

The early detection of fires and spontaneous heatings in South African collieries, by C. J. Fauconnier (General Mining Union Corporation Ltd).

The early detection of fires in gold mines, by P. S. Turner (Anglo American Corporation, Gold Division).

Fire fighting techniques, by P. Marais (Chamber of Mines Rescue Training Centre).

Chairmen: P. Harris (General Mining Union Corporation Limited, and A. N. Brown (Goldfields of S.A. Ltd).

APCOM International Conference

by H. W. GLEN

The 17th APCOM Conference (under the auspices of the Council for the Application of Computers and Mathematics in the Mineral Industries) was to have been held in Moscow during the last week in October. South Africans have always given enthusiastic support to the APCOM series of meetings, since their inception in 1961. The conference was held in the Republic in 1972.

Plans were well advanced for a South African delegation of 9 or 10, under the leadership of Dr D. G. Krige, to attend the Moscow Conference and to present several papers. However, the U.S.S.R. refused to grant visas to all but Dr Krige (and his wife, who was to have accompanied him) and members of the delegation who hold passports other than South African. An exception was made of Dr Krige in his personal capacity — and not as a representative of South Africa — because of his valuable work in this field and his contribution to earlier APCOM Conferences. Dr Krige's reply to this notification from the Organizing Secretary in Moscow was that he could not honourably accept in the circumstances, and that the South African delegates had decided as a group to with draw from the Conference.

In the meantime, the APCOM Council, under the Chairmanship of Dr Thys B. Johnson of the U.S.A., was considering the Council's position. On 31st July of this year, Dr Johnson wrote to the Chairman of the Organizing Committee in Moscow, Mr G. I. Nuzhdikhin (Deputy Minister of the Coal Industry of the U.S.S.R.), telling him of the Council's decision:

> As I have stated on numerous occasions, and in particular, in my letter to you of April 10, 1980, *APCOM conferences have always been open to all who wish to participate*, and if this policy did not continue the APCOM Council would have to withdraw official support of the Moscow conference. Although it is with regret, *the APCOM Council must withdraw official recognition of the Moscow conference because of the decision to bar South African delegates. This means the Moscow conference will not be the 17th APCOM Conference and the published proceedings from the Moscow conference will not be an APCOM publication.*
>
> I can appreciate that you and your committee have put forth considerable effort in preparing for the Moscow conference and may be very disappointed by this decision; however, representatives from the Soviet Union assured the APCOM Council at the time the decision was made to hold the 17th APCOM Conference in Moscow that delegates from any foreign country would be welcome to attend. This assurance by your representatives was an important factor in our decision to award the APCOM meeting to the U.S.S.R. Since this assurance has now been reversed, the Council has little choice but to withdraw its support.

Therefore, the 17th APCOM Conference is not to be held in Moscow. APCOM is still considering what further action to take, but it is probable that their meeting scheduled for April 1982 at the Colorado School of Mines will be designated the 17th APCOM Conference.