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Conference Reports

MINERALS ENGINEERING '91 CONFERENCE
20 - 22 FEBRUARY 1991, SINGAPORE

The Minerals Engineering '91 Conference was held from 22 to 22 February 1991 in the Marina Mandarin Hotel in Singapore. This conference, which was the first in a series that will be hosted annually under the auspices of the Minerals Engineering Journal, was organized by Dr. B. Wills and staff at Camborne School of Mines and reviewed the current status and future of mineral processing and extractive metallurgy. Although the conference attracted keen interest from across the world, a final total of only 61 delegates attended, the cause of the drastic reduction being the war in the Middle East. The impact was most severe for the USA delegates who were prevented from attending by company or university dictate.

A short course on column flotation was presented at the same venue on 18 and 19 February by Professors J. Finch from McGill University and G. Dobby from Toronto. This course dealt with both fundamental and applied aspects of column flotation technology, and novel or alternative flotation technologies.

A total of 41 papers were presented, which were divided into 10 technical sections. These sessions covered computer control and simulation, comminution and liberation, concentration, flotation fundamentals, flotation technology, ferrous metallurgy, gold processing, environmental, hydro- and biometallurgy, and miscellaneous topics.

Flotation and related topics accounted for a total of 12 papers, ranging from flotation control, surface chemistry and mechanisms of collector adsorption, to the recent developments in column flotation. Three papers dealt with leaching, mineral bioprocessing and bacterial oxidation, other topics including carbon-in-pulp systems, hydrocyclone preparation of backfill material, thickener operation, sorting, liberation and quantitative mineralogy. Topics related to pyrometallurgy included the progress in the development of new ironmaking technologies and the processing of steel-making flue dust.

The impact of mineral processing industries on the environment, and the very important work that is being done to lessen the harmful effects of technology on nature, were covered in three interesting papers on air pollution control, the disposal of fine mill tailings as aggregates, and the novel use of ion exchange materials as an aid to reclaiming derelict mining land.

Three papers dealt with aspects of magnetic separation. In the first of these, A. Stradling of J.K. Mineral Research Centre, Australia described the progress towards a general model of a cross-belt magnetic separator, to be used as a process design and optimisation tool in the mineral sands industry. A technique has also been developed for characterising the mineral sands feedstocks in terms of the distribution of magnetic susceptibility. Fractions of similar magnetic properties were obtained by a Permroll laboratory separator, while Satmagan magnetic balance was calibrated to measure the specific magnetic susceptibility of each fraction. The susceptibility was shown to vary with temperature according to the Curie- Weiss law. The process model enables calculation of the mass recovery of mineral reporting to the product at each pole, given the feedrate, mineral temperature, magnetic field strength and the gradient.

J.H.P. Watson and Z. Li of Southampton, UK presented a study on the mechanical entrapment of non-magnetic material in HGMS and vibration HGMS.

The study revealed that the magnetic capture on the upstream side of the wires used in HGMS would inevitably lead to mechanical entrapment. A number of ways used to improve the selectivity of HGMS were evaluated and the results have shown that the vibration HGMS has advantages over the other method. A novel method, the so-called cryogenic cell method, has also been developed. This method, when used together with the microscopic system, can provide an insight into the capture of the magnetic material on a single wire. It also confirmed that this method is an efficient diagnostic tool for the investigation on magnetic separation.

In the third contribution on magnetic separation, H.D. Wasmuth and K.H. Unkelbach of KHD Humboldt Wedag, Germany, described developments over the last ten years in the magnetic separation of feebly magnetic minerals. Many new concepts and developments have been achieved by increasing the magnetic field strength and/or its gradient. Open-gradient magnetic separators (OGMS) have found particularly interesting application, mainly due to the use of new high-duty rare-earth permanent magnets and the introduction of superconducting magnets. The authors described the conceptual design, characteristic features and some examples of application of the new-generation OGMS units. In addition, some further developments of the Jones wet high-intensity magnetic separator were outlined.

The proceedings of the conference have been published in a special issue of Minerals Engineering Journal, vol. 4, nos. 7 to 11. The Minerals Engineering '92 Conference will take place in Vancouver, Canada in April 1992.

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THE IMM MAGNETIC SEPARATION MEETING
LONDON, 5 NOVEMBER 1990

A general meeting of IMM on the theme of magnetic separation was held in London on 5 November 1990 and four invited contributions were presented for discussion.

S.T. Hall of the University of Nottingham presented a paper with the title "Magnetic separation - past, present and future" in which the past and present positions of magnetic separation in the minerals industry were considered by way of a brief introduction to the main theme, which dealt with the problems of selectivity. An attempt was made to predict future developments in magnetic separation technology.

I.S. Wells of Boxmag-Rapid, Ltd., Birmingham, discussed the industrial applications of high-intensity permanent magnetic separators that utilize neodymium-iron-boron magnets.

A.A. Stadtmuller of Cryogenic Consultants, Ltd., London, summarized the developments of industrial superconducting magnetic separators. Such separators are currently manufactured by three different companies and are presently operational in three continents. Details of the features unique to superconducting magnets that, when properly exploited, can result in economically beneficial magnetic separators were given. The different industrial superconducting separators presently in operation were described. Some aspects of future developments were discussed.

S. Newton of Warren Spring Laboratory, Stevenage, presented the methods of mathematical modelling of wet high-intensity magnetic separation.

THIRD CONFERENCE "THEORETICAL AND PRACTICAL PROBLEMS OF MAGNETIC SEPARATION OF MINERALS" 3 TO 5 OCTOBER 1989, CZECHOSLOVAKIA

Although this review arrives almost two years after the conference was held, we feel that the magnetic separation fraternity would like to be informed about this event which presently represents the only regular specialised convention on magnetic separation.

The conference was held, as a rule, in the High Tatras near Poprad, Czechoslovakia, and was well attended by nearly 90 participants from Poland, Bulgaria, East Germany, Czechoslovakia and the Soviet Union. Twenty nine papers were presented, in five languages (Czech, Slovak, Polish, German and Russian) and some of them, randomly selected, will be surveyed.

Azbel et al. (USSR) reviewed a wide range of high- intensity magnetic separators that have recently been introduced in the Soviet mining industry. Electromagnetic roll separators, either wet or dry, have been successfully applied to a variety of ores and industrial minerals. High-gradient magnetic separator ERFM, a variant of the Jones separator, with improved efficiency, particularly at particle sizes smaller than 75 micrometers, has been tested on a wide spectrum of minerals (tungsten tailings, ilmenite, loparite) and it is claimed that a considerable reduction of losses of valuable minerals into the final tailings was achieved. A wealth of specifications of magnetic separators discussed in the presentation, and of technological results was given.

Mangusevsky (ZB, Czechoslovakia) presented a survey of recent developments of HGMS in ZB. Detailed description of the 6-ERM-35/315 separator of Soviet origin, manufactured by ZB, was given.

Duch (ZB, Czechoslovakia) reviewed the current activities in design and construction of low-intensity magnetic separators in ZB. ZB is the world's largest manufacturer of magnetic separators and during the last five years 720 low-intensity magnetic separators were exported to the USSR alone, with many more delivered either locally or to other countries. A modified version of a wet low-intensity magnetic separator was developed for application at Krivoy Rog Iron Ore plant. New features introduced into the design include continuous monitoring of the rotation of a drum and of the level of the slurry in a tank.

In a paper by Zezulka (Ore Research Institute, Czechoslovakia), the design and construction of a continuous HGMS separator for kaolin beneficiation was outlined. In order to overcome the limitations of a short duty cycle of a cyclic HGMS, as applied in kaolin industry, this separator is based on the same concept as the continuous VMS separator, except for continuously adjustable flow velocity of the slurry through the matrix. The separator, designed by the Ore Research Institute and manufactured by ZB was successfully tested in a kaolin plant.

Brozek et al. (Mining Academy, Poland) reviewed the current activities in the application of magnetic separation technology to minerals processing in Poland.

Bajtos and Bajkayova (ZB, Czechoslovakia) presented a most interesting paper that described practical experience with VMS and 6-ERM HGMS production-scale separators which were tested concurrently on iron-ore beneficiation. It was observed that the 6-ERM separator was more efficient for particles smaller than 46 micrometers. On the other hand, the VMS separator was found to give considerably better results for particles greater than 80 micrometers. It is, however, obvious that such a comparison is conditional only, since it depends on selection of the matrix in the VMS unit. Rods, 3 mm in diameter, used in VMS do not lend themselves to efficient performance on fine-size fractions and it is likely that with

finer matrix (e.g. woven mesh) the performance of the VMS machine would not have been worse than that of 6- ERM separator on fine size fractions.

Chovanec et al. (Electrotechnical Institute, Czechoslovakia) reported the results of beneficiation of coal by a superconducting HGMS. It was found that up to 50 per cent of total sulphur could be removed from the coal at about 90 per cent recovery of combustible matter.

Holubar (Pramet, Czechoslovakia) presented a paper that dealt with the sorting of synthetic diamonds using magnetic separation which became an inherent cleaning and sorting technique in the production of synthetic diamonds.

Klisuranov and Ivanov (Bulgaria) discussed an intriguing design of a matrix that reduces mechanical entrainment and eliminates nonuniform loading of the matrix along its depth. The matrix consists of a combination of profiled rods and plates of trapezoidal cross-section. The gap between the rods and the plates decreases, and the magnetic force increases, along the depth of the matrix so that magnetic particles that were not captured at the upper layers of the matrix had a greater probability of being recovered at lower section of the matrix bed. This novel design of a graded matrix is claimed to have lead to better selectivity of separation and to better grade of the concentrate.

All contributions presented at the conference were published in the form of Proceedings which, however, owing to their limited availability and language barrier, would be of limited use to a western reader.

The fourth conference on the same theme is scheduled to be held in 1992.