TUESDAY, AUGUST 23, 2005, P.M.

SESSION 21: INTERNATIONAL SYMPOSIUM ON COMPUTATIONAL ANALYSIS IN HYDROMETALLURGY (35TH ANNUAL HYDROMETALLURGY MEETING)

SIMULATION II
Sponsor(s): Hydrometallurgy Section, The Metallurgical Society of CIM
Room: Herald
Chairmen: V. PAPANGELAKIS, University of Toronto, Canada and
J. DUTRIZAC, CANMET, Canada

PAPER 21.1—14:00
DATA RECONCILIATION IN HYDROMETALLURGY: APPLICATIONS TO LEACHING OF CLAY AND COPPER SOLVENT EXTRACTION.
C. BAZIN, K. EL-OUASSITI, D. HODOUIN and M. ZOUADI, Laval University, Canada

Data reconciliation techniques are used to attenuate the effect of measurement errors and estimate unmeasured variables. This paper illustrates the application of data reconciliation to hydrometallurgy processes using measurements from leaching and solvent extraction obtained from laboratory experiments. The application of data reconciliation provides an efficient way to detect gross and systematic errors and produces reliable performance indices for process evaluation.

PAPER 21.2—14:25
COMPUTATIONAL POWER AND ION-EXCHANGE MODELLING.
A. NESBITT and J. ABRAHAMS, Cape Peninsula University of Technology, South Africa

Over the past half-century, researchers have commented on the complexities of ion-exchange processes, but have been forced to use gross assumptions to simplify the associated mathematics sufficiently for mathematical models to be of practical use, given the available computational power. This paper reviews the development of increasingly complex models as computational power has increased over the past half-century, from the direct application of Fick's Law in 1947, through to today's models requiring finite-element methods. The assumptions required for and the associated limitations of the various models are presented and the associated computational complexities are discussed. A case study is presented in which a continuous loss of capacity in an acid resin was observed over about sixty cycles of loading and elution. Resin poisoning does not explain this observation. This paper presents the capacity loss data, speculates on possible causes of the phenomenon, discusses why conventional kinetic and equilibrium mechanisms cannot explain it and concludes that the need to develop a more rigorous model is apparent. The significance of this observation is that standard tests done for a new resin application could significantly overestimate the commercial performance of the resin concerned, highlighting the importance of computer simulation in this field of process engineering.

PAPER 21.3—14:50
WATER MANAGEMENT SIMULATION FOR THE POGO GOLD MINE.
L. GORMELY, B. NETHERY, G. BECKSTEAD, AMEC Americas Ltd., Canada,
R. ZIMMER, Teck Cominco Ltd., Canada and
K. HANNEMAN, Teck-Pogo Inc., Canada

As part of the EIS and permitting activities for the Pogo Mine in Alaska, a risk assessment study for the water management plan was carried out. The basis for the study was a site water volume and contaminant balance model. Probabilistic modeling was carried out using the @Risk Monte Carlo simulation package to investigate the frequency, quantity, and quality of discharges under varying assumptions. The results were used in discussions with regulatory officials as part of the permitting process for the project. The simulation allows probabilistic modeling of key environmental parameters based on input frequency distributions involving both quality and quantity of flow. When combined with predictions of water treatment plant capacities and removal efficiency, this was very useful for defining the likelihood of important regulatory outcomes. Based on the model, certain project modifications were made. Using the simulation as a basis, ongoing dialog with regulators led to consensus that all potential risks have been considered and mitigated for the Pogo Mine according to their likelihood and severity, and that regulatory requirements would be achieved. The paper describes the model and some of the applications for which it was used.

COFFEE BREAK—15:15-15:45

PAPER 21.4—15:45

HEAPSIM – UNRAVELLING THE MATHEMATICS OF HEAP BIOLEACHING.

N. OGBONNA, J. PETERSEN, University of Cape Town, South Africa and
D.G. DIXON, University of British Columbia, Canada

Although heap bioleaching has been recognized as an economic alternative for treating low grade mineral ores, the underlying physical, chemical and biological processes involved are complex. A detailed investigation into the dynamics of heap bioleaching processes has provided much insight into the underlying complexities, and has led to the development of a sophisticated modeling tool – HeapSim. This tool can be of great help in the design and operation of heap bioleaching processes. In this paper, the mathematical model implemented in HeapSim is examined. The model takes into account mineral kinetics, particle level effects, bacterial growth, oxidation and adsorption, gas absorption, pore diffusion, bulk advection, gas balance and heat conservation. Three case studies where the model has been applied are briefly discussed.

PAPER 21.5—16:10

CURRENT DISTRIBUTION IN MODERN COPPER REFINING.

N.J. ASLIN, W. WEBB, Xstrata Technology, Australia and
D. STONE, P.I. International, U.S.A.

In today's modern copper electro-refineries, increasingly higher average current densities are being employed. With these increases many refineries are approaching their limiting current density. The nearness of the average operating current density to the limiting current density has placed increasing emphasis on the need to maintain an even current distribution. This paper explores the importance of maintaining even current density and discusses the factors, processes and practices that are necessary to achieve and maintain high quality production at high operational intensity.