

## Table of Contents

Australian Centre for Geomechanics .....	iii
Committees .....	v
Preface.....	ix
Foreword .....	xi

### Session 1: Thickening

#### Keynote Address

Improving the Sustainability of Residue Management Practices – Alcoa World Alumina Australia .....	3
<b>D.J. Cooling, Alcoa World Alumina Australia, Australia</b>	

Design of a WesTech HiDensity™ Paste Thickener for Bauxite Tailings .....	17
<b>J.H. Easton, WesTech Engineering, Inc., USA, J.S. Slottee, PasteThick Associates, USA, E.M. de Oliveira, WesTech Equipamentos Industriais LTDA, Brazil</b>	

The Design and Commissioning of a Scale Thickener Test Laboratory for Measurement and Control Testing .....	25
<b>A.C. Roebl, De Beers Group Services, South Africa</b>	

Arch Coal Paste Thickener Case Study .....	33
<b>B.K. Gupta, Arch Coal, USA, J.L. Johnson, PasteThick Associates, USA</b>	

Paste Thickeners – Design and Engineering Options to Meet Today's Project Needs .....	41
<b>S. Courtenay &amp; R. Triglavcanin, Outokumpu Technology Pty Ltd, Australia</b>	

A Short History of Deep Cone Thickener Development .....	51
<b>F.R. Schoenbrunn, Dorr-Oliver Eimco, USA</b>	

Pogo Plant Paste Thickener Design .....	57
<b>H. Harper &amp; D. Wyatt, Outokumpu Technology, Canada, E. Konigsmann, Teck Cominco Limited, Canada, C. Kujawa, Outokumpu Technology, USA</b>	

A Water Recovery Comparison of Two Kimberlite Paste Systems.....	65
<b>A.J. Vietti, F. Dunn &amp; M. Cooks, Paterson and Cooke Consulting Engineers (Pty) Ltd, South Africa, B. Busani, Debswana Diamond Company, Botswana, J. Houman, De Beers Consolidated Mines Limited, South Africa</b>	

### Session 2: Backfill

Developments and Experience with Harvested Tailings Paste Fill Systems .....	75
<b>A.G. Grice, M.G. Dorricott &amp; K. Kuganathan, AMC Consultants Pty Ltd, Australia, G. Garbin, Aquila Mining Pty Ltd, Australia</b>	

State-of-the-Art in Paste Fill Technology in the Mining Industry – A Functional Review .....	81
<b>K. Kuganathan &amp; A.G. Grice, AMC Consultants Pty Ltd, Australia</b>	

Influence of Tailings Type on Barricade Loads in Backfilled Stopes .....	95
<b>M. Helinski &amp; A.P. Coltrona, The University of Western Australia, Australia, A.B. Fourie, Australian Centre for Geomechanics, Australia, M. Fahey, The University of Western Australia, Australia</b>	

Development of George Fisher Mine's Paste Fill Product from Tailings Dam Extraction to the Completion of Mixing .....	105
<b>J.D. Steel, Xstrata Zinc, George Fisher Mine, Australia</b>	

### Session 3: Transport

#### Keynote Address

Pipelining Tailings, Pastes and Backfill.....	113
<b>L. Pullum, Consulting Engineer, Australia</b>	

Thickened and Paste Tailings Pipeline Systems – Design Procedure, Part 2 .....	129
<b>R. Cooke, Paterson and Cooke Consulting Engineers (Pty) Ltd, South Africa</b>	

Transition Velocity Estimation for Flow in Large Pipes .....	141
<b>P.T. Slatter, Cape Peninsula University of Technology, South Africa</b>	
Laboratory Evaluation of the Potential for Electrokinetic Belt Filter Press Dewatering of Kimberlite Slimes.....	147
<b>J. Lamont-Black, Electrokinetic Ltd, UK, C.J.F.P. Jones &amp; S. Glendinning, University of Newcastle, UK, D.T. Huntley, Electrokinetic Ltd, UK, A.B. Fourie, Australian Centre for Geomechanics, Australia</b>	
A First Slurry Pump Standard and Some Implications for Paste Applications .....	153
<b>G.R. Addie, GIW Industries, USA, A. Sellgren, Lulea University of Technology, Sweden</b>	
Quantifying the Effect of Pump Shear on Slurry Rheology – A Case Study at the Combined Treatment Plant .....	163
<b>J. Houman, De Beers Consolidated Mines Limited, South Africa, A.J.C. Paterson &amp; F. van Sittert, Paterson and Cooke Consulting Engineers (Pty) Ltd, South Africa</b>	
A De-Rating Method for Centrifugal Pumps Pumping “Paste” .....	175
<b>L. Pullum, Consulting Engineer, Australia, L.J.W. Graham &amp; M. Rudman, CSIRO Manufacturing and Materials Technology, Australia</b>	
Advantages of Pulsation Damping for Hydraulic Driven Piston Pumps in Paste and Thickened Tailings Transport.....	185
<b>P. Peschken &amp; V. Ludewig, Putzmeister AG, Germany</b>	

#### **Session 4: Rheology**

Fuzzy Rheology and Smooth Running Paste Systems .....	199
<b>D.J. Hallbom, Pipeline Systems Incorporated and University of British Columbia, Canada, W.J. Norwood, Pipeline Systems Incorporated, USA</b>	
The “Fifty Cent” Rheometer-Effect of Slip, Speed of Lift and Stability on Measurement of Yield Stress .....	211
<b>R. Haldenwang, P.T. Slatter &amp; I. Masalova, Cape Peninsula University of Technology, South Africa</b>	
Limitations to the Use of the Modified Slump Test for Yield Stress Determination.....	219
<b>A.B. Fourie, Australian Centre for Geomechanics, Australia, F. Dunn, Paterson and Cooke Consulting Scientists (Pty) Ltd, South Africa</b>	
Dewatering and Clays – The Importance of Controlling Dispersion ‘Up-Front’ .....	229
<b>F. Sofrà, Rheological Consulting Services Pty Ltd, Australia, A.R. Kilcullen, Particulate Fluids Processing Centre, The University of Melbourne, Australia, P.J. Scales, Rheological Consulting Services Pty Ltd, and Particulate Fluids Processing Centre, The University of Melbourne, Australia</b>	
Effect of Aggregants on Mineral Pastes and High Density Slurries .....	239
<b>A.C. de Araujo &amp; G.E.S. Valadão, Universidade Federal de Minas Gerais, Brazil, C.A. Hernández, Universidad Arturo Prat, Chile</b>	

The Bucket Rheometer for Thickened Tailings and Paste Flow Curve Determination .....	249
<b>F. Sofrà, Rheological Consulting Services Pty Ltd, Australia, D.T. Fisher, Particulate Fluids Processing Centre, The University of Melbourne, Australia, D.V. Boger, Rheological Consulting Services Pty Ltd, and The University of Melbourne, Australia</b>	

Extracting Rheological Parameters From Low Shear Rate Flow Loop Data.....	259
<b>D.J. Hallbom, Pipeline Systems Incorporated and University of British Columbia, Canada</b>	

#### **Session 5: Surface Disposal**

MFT Drying – Case Study in the Use of Rheological Modification and Dewatering of Fine Tailings Through Thin Lift Deposition in the Oil Sands of Alberta .....	271
<b>P.S. Wells &amp; D.A. Riley, Suncor Energy Inc., Canada</b>	
An Evaluation of Highly Dewatered Tailings Disposal Applications in Large Scale Mining Operations in Chile’s Atacama Desert .....	285
<b>J.C. Scola, Golder Associates SA, Chile, D. Landriault, Golder Paste Technology Ltd, Canada</b>	

A Novel Approach to Dry Stacking and Land Rehabilitation Using Ciba® RHEOMAX™ ETD Technology.....	295
<b>S. Adkins &amp; I.J. Flanagan, Ciba Specialty Chemicals, UK, J. Lamperd, Ciba Specialty Chemicals, Australia, S. Rose, Ciba Specialty Chemicals, UK</b>	
Simulation of Thickened Tailings Stacks .....	305
<b>T.G. Fitton, RMIT University, Australia, M.P.A. Williams &amp; K.D. Seddon, Australian Tailings Consultants, Australia, S.N. Bhattacharya &amp; A.G. Chryss, RMIT University, Australia</b>	
Prediction of Non-Segregating Thickened Tailings Beach Slope – A New Method .....	315
<b>B. Pirouz, K.N. Toosi University of Technology, Iran, M.P.A. Williams, Australian Tailings Consultants, Australia</b>	
On the Relation Between Laboratory Flume Tests and Deposition Angles of High Density Tailings .....	329
<b>P. Simms, Carleton University, Canada</b>	

### **Session 6: Operational Experiences**

Osborne High Density Discharge – An Update from 2004 .....	339
<b>G.I. McPhail, Metago Environmental Engineers (Australia) Pty Ltd, Australia, C. Brent, Barrick Osborne Mine, Australia</b>	
Ash Thickening Project, Hazelwood Power Station .....	351
<b>G.B. New, K.G. Keam &amp; A.G. Sweeney, GHD Pty Ltd, Australia</b>	
Design of a Thickened Mill Sands Management System within a Heap Leach Pad .....	361
<b>T.F. Kerr &amp; P.D. Duryea, Knight Piésold and Co., USA, W. Grobbelaar, Paterson and Cooke Consulting Engineers, Chile, K. Hackney, Minera Yanacocha S.R.L., Peru</b>	
Free Surface Flow of Thickened Tailings with Adverse Rheological Parameters .....	373
<b>R. Hills, S. Barrera &amp; C. Riveros, ARCADIS Geotecnica, Chile, N. Saldía, Compañía Minera Doña Inés de Collahuasi, Chile</b>	

### **Session 7: Emerging Issues**

European Standards of Global Relevance — Implications for the Adoption of Paste Technology .....	387
<b>J.A. Drielsma, European Association of Mining Industries (Euromines), Belgium, M. Cambridge, Cantab Consulting Ltd, UK</b>	
Post-Liquefaction Stability of Thickened Tailings Beaches .....	395
<b>K.D. Seddon, Australian Tailings Consultants, Australia</b>	
From Tailings to Paste .....	407
<b>A. Penman, ICOLD Tailings Committee, UK</b>	
Authors Index.....	413