

TECHNICAL AND SOCIAL PROGRAMME

14 – 16 October, Sheraton Miramar Hotel & Convention Center, Viña del Mar, Chile

WEDNESDAY, 14 OCTOBER.

16:00-20:00 **Registration.** Foyer, Level Z.

17:00-17:45 **Authors and Session Chairs Coordination Meeting.** Sausalito Ballroom.

18:00-19:00 **Inauguration Ceremony.** José Francisco Vergara BC Ballroom.

Opening Address. *Carlos Barahona*, Executive Director, IFACMMM 2009.

Words of Welcome. *Dr. José Rodríguez*, Rector, Universidad Técnica Federico Santa María, Chile.

Words of Welcome. *Prof. Luis Bergh*, IPC Chair IFACMMM 2009, Universidad Técnica Federico Santa María, Chile.

Keynote Address. Development and Competitiveness of Mining Business: Role of Innovation.

Francisco Costabal, President of Consejo Minero, Chile.

19:00-20:00 **Welcome Reception,** Foyer, Level Z.

THURSDAY, 15 OCTOBER. JOSÉ FRANCISCO VERGARA BC BALLROOM

08:20-08:30 **Day 2 Programme Presentation and News Update.** *Víctor Babarovich*, IFACMMM 2009 Technical Coordinator, Gecamin.

Plenary Session 1

Chair: **Juan Yianatos**, Universidad Técnica Federico Santa María, Chile.

08:30-09:15 **Automatic Control in Mineral Processing Plants: An Overview.**

Prof. Daniel Hodouin, Université Laval, Canada.

09:15-10:00 **Operational Variables and Networks for Remote and Autonomous Mining.**

Dr. Luis Mujica, Micomo S.A.

10:00-10:40 **Poster Session and Coffee Break,** José Francisco Vergara A Ballroom and Foyer Level Z.

JOSE FRANCISCO VERGARA B BALLROOM - 15 October	JOSE FRANCISCO VERGARA C BALLROOM – 15 October
<p>Session 1. Ore Processing: Grinding 1. Chair: Daniel Sbarbaro, Universidad de Concepción, Chile.</p> <p>10:40-11:00 Modeling and Simulation of Cone Crushers. <i>Andreas Johansson</i>, Luleå University of Technology, Sweden. Presented by Soheil Salehpour.</p> <p>11:00-11:20 RNMPC Applied to a Nonlinear Model of a ROM Ore Milling Circuit. <i>Loutjie Coetzee</i>, MINTEK, South Africa; <i>Ian Craig</i>, University of Pretoria, South Africa; <i>Eric Kerrigan</i>, Imperial College London, United Kingdom.</p> <p>11:20-11:40 Experiences and Lessons with Advanced Control Systems for the SAG Mill Control in Minera Los Pelambres. <i>Daniel Silva</i>, Minera Los Pelambres; <i>Luis Tapia</i>, Minera Esperanza, Chile.</p> <p>11:40-12:00 A Two-phase Objective Function for a Constrained MPC and its Application to the Grinding Plant. <i>Alexey Zakharov</i>, <i>Alexandre Boriouchkine</i> and <i>Sirkka-Liisa Jämsä-Jounela</i>, Helsinki University of Technology, Finland.</p> <p>12:00-12:20 Multivariable Model Predictive Control of a Simulated SAG Plant. <i>César Garrido</i>, Minera Los Pelambres; <i>Daniel Sbarbaro</i>, Universidad de Concepción, Chile.</p> <p>12:20-12:40 The Economics of Remote Monitoring, Maintenance and Engineering in Mining Applications. <i>Jack Murray</i>, Emerson, USA; <i>Christian Cacciavillani</i>, Emerson, Argentina. Presented by <i>Hugo Barrientos</i>.</p>	<p>Session 2. Steel: Casting. Chair: Sangchul Won, Pohang University of Science and Technology Postech, Korea.</p> <p>10:40-11:00 Weight Control of Pouring Liquid by Automatic Pouring Robot. <i>Yoshiyuki Noda</i> and <i>Kazuhiko Terashima</i>, Toyohashi University of Technology; <i>Makio Suzuki</i> and <i>Hiroyasu Makino</i>, Sinto Kogio Ltd., Japan.</p> <p>11:00-11:20 Cancellation of Bulging Effect on Mold Level in Continuous Casting: Experimental Validation. <i>Karim Jabri</i>, <i>Alain Mouchette</i> and <i>Bertrand Bèle</i>, ArcelorMittal Research; <i>Emmanuel Godoy</i> and <i>Didier Dumur</i>, Supélec, France.</p> <p>11:20-11:40 Pressing Velocity Control Considering Liquid Temperature Change in Press Casting Process. <i>Ryosuke Tasaki</i>, <i>Yoshiyuki Noda</i> and <i>Kazuhiko Terashima</i>, Toyohashi University of Technology; <i>Kunihiro Hashimoto</i>, SintoKogio Ltd., Japan.</p> <p>11:40-12:00 Particle Swarm Optimization Based Tuning of a Modified Smith Predictor for Mold Level Control in Continuous Casting. <i>Karim Jabri</i>, <i>Alain Mouchette</i> and <i>Bertrand Bèle</i>, ArcelorMittal Research; <i>Didier Dumur</i> and <i>Emmanuel Godoy</i>, Supélec, France.</p> <p>12:00-12:20 Defect Detection Algorithm in Steel Billets Using Morphological Top-Hat Filter. <i>Dongwook Lee</i>, <i>Young-il Kang</i> and <i>Sangchul Won</i>, Pohang University of Science and Technology Postech; <i>Changhyun Park</i>, Pohang Iron Steel Company, Korea.</p>

12:40 - 14:00 LUNCH, MARÍA LUISA BOMBAL BALLROOM.

JOSE FRANCISCO VERGARA B BALLROOM - 15 October	JOSE FRANCISCO VERGARA C BALLROOM – 15 October
<p>Session 3. Ore Processing: Instrumentation 1. Chair: Claudio Acuña, Universidad Católica del Norte, Chile.</p> <p>14:00-14:20 Image-based Level Measurement in Flotation Cells Using Particle Filters. <i>Phanindra Jampana, Saneej Chitrallekha and Sirish Shah, University of Alberta, Canada.</i></p> <p>14:20-14:40 Machine Vision of Flotation Froths with a Rapid-Prototyping Platform. <i>Jani Kaartinen and Timo Roine, Helsinki University of Technology; Jari Hätönen, Borealis Polymers Oy, Finland.</i></p> <p>14:40-15:00 A Virtual Sensor For Estimating Particle Size of Hydrocyclones' Overflow. <i>Luis Nieto, Jose Olivares and Jose Gatica, Honeywell; Benjamin Ramos and Hugo Olmos, El Teniente, Codelco, Chile.</i></p> <p>15:00-15:20 Automated Online Measurement of Particle Size Distribution using 3D Range Data. <i>Matthew Thurley, Luleå University of Technology, Sweden.</i></p> <p>15:20-15:40 Reflectance Spectroscopy in the Analysis of Mineral Flotation Slurries. <i>Olli Haavisto and Heikki Hyötyniemi, Helsinki University of Technology, Finland.</i></p>	<p>Session 4. Steel: FDI and Modeling. Chair: Didier Theilliol, Nancy-Université, France.</p> <p>14:00-14:20 Decentralized and Autonomous Design for FDI of Distributed Control Systems. <i>Dominique Sauter, Taha Boukhobza, Frédéric Hamelin and Didier Theilliol, Nancy-Université, France.</i></p> <p>14:20-14:40 Fault Detection of a Blending Tank Process Using Mixed Integer Linear Programming. <i>Soheil Salehpour, Andreas Johansson and Thomas Gustafsson, Luleå University of Technology, Sweden.</i></p> <p>14:40-15:00 Characterisation of Model Error for Charpy Impact Energy of Heat Treated Steel Using Probabilistic Reasoning and a Gaussian Mixture Model. <i>Mahdi Mahfouf, Yong Yang and Qian Zhang, The University of Sheffield, United Kingdom.</i></p> <p>15:00-15:20 Prediction of Machining Induced Residual Stresses in Aluminium Alloys Using a Hierarchical Data-Driven Fuzzy Modeling Approach. <i>Qian Zhang, Mahdi Mahfouf, Soufiene Boumaiza, John Yates, Christophe Pinna and Richard Greene, The University of Sheffield, United Kingdom; Luis de Leon, Leibniz University, Germany.</i></p> <p>15:20-15:40 Modeling Charpy Impact Energy of Heat-Treated-Steel using Efficient Neural-Networks and Genetic-Algorithms. <i>Mahdi Mahfouf, Yong Yang and Qian Zhang, The University of Sheffield, United Kingdom.</i></p>

15:40 - 16:20 POSTER SESSION AND COFFEE BREAK, JOSÉ FRANCISCO VERGARA A BALLROOM, FOYER, LEVEL Z.

JOSE FRANCISCO VERGARA B BALLROOM - 15 October	JOSE FRANCISCO VERGARA C BALLROOM – 15 October
<p>Session 5. Ore Processing: Flotation 1. Chair: Luis Bergh, Universidad Técnica Federico Santa María, Chile.</p> <p>16:20-16:40 Troubleshooting and Diagnostic of Industrial Flotation Cells. <i>Juan Yianatos, Luis Bergh and Francisco Díaz, Universidad Técnica Federico Santa María, Chile.</i></p> <p>16:40-17:00 A Framework for the Modeling and Simulation of the Behaviour of a Specific Ore in Flotation Circuits. <i>Casper Steenkamp and David Phillpotts, Mintek, South Africa.</i></p> <p>17:00-17:20 Control of Flotation and Acquisition of the Key Control Variables. <i>Leopold Blahous and Thomas Marx, ABB Switzerland, Switzerland. Presented by Iván Acevedo.</i></p> <p>17:20-17:40 Integrating Separability Curves to Expert Control Systems of Flotation Plants. <i>Luis Bergh and Juan Yianatos, Universidad Técnica Federico Santa María, Chile.</i></p> <p>17:40-18:00 Application of Adaptive Control for a Pilot-Scale Flotation Column. <i>Maria Persechini, Federal University of Minas Gerais, Brazil.</i></p>	<p>Session 6. Pyrometallurgy: Instrumentation and Control. Chair: José Ragot, Nancy-Université, France.</p> <p>16:20-16:40 Digital Vision to Support the Operation of a Teniente Converter. <i>Max Schaaf and Aldo Cipriano, Pontificia Universidad Católica de Chile; Zacarías Gomez, Division Salvador, Codelco, Chile.</i></p> <p>16:40-17:00 Estimation of Phases Levels in a Teniente Converter Using Machine Vision. <i>Max Schaaf and Aldo Cipriano, Pontificia Universidad Católica de Chile; Zacarías Gomez, Division Salvador, Codelco, Chile.</i></p> <p>17:00-17:20 Robust Data Reconciliation to Determine Basic Oxygen Furnace Set-points. <i>Julien Francken, Didier Maquin and José Ragot, Nancy-Université; Bertrand Bèle, ArcelorMittal Research Maizières, France.</i></p> <p>17:20-17:40 Application of Model-Predictive Control to Multi-Hearth Nickel Reduction Roasters. <i>Rubiné Gouveia, Votarantim Metais Niquel, Brazil; Geoff Lewis, Invensys Process Systems, United Kingdom; Alfredo Restrepo, Lucas Rodrigues and Rubens Gedraite, Invensys Process Systems, Brazil.</i></p> <p>17:40-18:00 Multivariable Control Application for the Flash Furnace at Codelco Norte. <i>Mallén Gajardo, División Codelco Norte, Codelco, Chile.</i></p>

19:00-22:30 COCKTAIL (FOYER, LEVEL Z) AND BANQUET DINNER (MARÍA LUISA BOMBAL BALLROOM).

FRIDAY, 16 OCTOBER. JOSÉ FRANCISCO VERGARA BC BALLROOM

08:20-08:30 **Day 3 Programme Presentation and News Update.** *Víctor Babarovich*, IFACMMM 2009 Technical Coordinator, Gecamin Ltd.

Plenary Session 2

Chair: **Dr. Guillermo González, Universidad de Chile.**

08:30-09:15 **Innovation Cycles of Innovative Automation Projects in the Mining Industry.**

Claudio Maggi, CORFO, Chile.

09:15-10:00 **Strategic Alignment of Automation Projects at Codelco.**

Francisco Amiama, Codelco, Chile.

10:00-10:40 **Poster Session and Coffee Break**, José Francisco Vergara A Ballroom and Foyer, Level Z.

JOSE FRANCISCO VERGARA B BALLROOM - 16 October

Session 7. Ore Processing: Flotation 2.

Chair: **Maria Persechini, Federal University of Minas Gerais, Brazil.**

10:40-11:00 **The Long Way towards Multivariate Predictive Control of Flotation Processes.**

Luis Bergh and *Juan Yianatos*, Universidad Técnica Federico Santa María, Chile.

11:00-11:20 **Multivariable Expert Fuzzy Control for a Rougher Flotation Circuit, Considering Grade Estimation in Intermediate Cells.**

Daniel Rojas and *Aldo Cipriano*, Pontificia Universidad Católica de Chile; *Jorge Cáceres*, Universidad Tecnológica de Chile, Chile.

11:20-11:40 **Global Characterization of Froth Speed Behavior in a Rougher Flotation Line.**

Felipe Nuñez, *Gabriel Tejada* and *Aldo Cipriano*, Pontificia Universidad Católica de Chile; *Daniel Silva*, Minera Los Pelambres, Chile.

JOSE FRANCISCO VERGARA C BALLROOM – 16 October

Session 8. Steel: Hot Rolling, Metals.

Chair: **Kazuya Asano, JFE Steel Corporation, Japan.**

10:40-11:00 **Real-time Implementation of New Nonlinear Neural Adaptive Generalized Predictive Speed Control for an Experimental Hot-Rolling Mill.**

Sid-Ahmed Gaffour, *Mahdi Mahfouf*, *Yong Yang*, *Miguel Gama* and *Qian Zhang*, The University of Sheffield, United Kingdom.

11:00-11:20 **Robust Decentralized Tension Control in Hot Rolling.**

Kazuya Asano and *Takashi Motomura*, JFE Steel Corporation, Japan.

11:20-11:40 **Tensile Strength Prediction for Hot Rolled Steels by Bayesian Neural Network Model.**

Yong Yang, *Mahdi Mahfouf*, *Derek Linkens* and *Qian Zhang*, The University of Sheffield, United Kingdom.

JOSE FRANCISCO VERGARA B BALLROOM - 16 October	JOSE FRANCISCO VERGARA C BALLROOM – 16 October
<p>11:40-12:00 On Reconfigurability for Actuator Faults under Reliability Constraints. <i>Ahmed Khelassi, Didier Theilliol and Philippe Weber, Nancy-Université, France.</i></p>	<p>11:40-12:00 Model Predicting Control for Line Pacing in Steel Processing Lines. <i>Eiji Konaka, Meija University; Tatsuya Suzuki, Nagoya University; Kazuya Asano and Yoshitsugu Iijima, JFE Steel Corporation; Japan.</i></p>
<p>12:00-12:20 Control of Copper-Molybdenum Ore Concentration on the Basis of Continuous X-ray-fluorescence Analysis. <i>Valeriy Morozov, Moscow State University of Mining, Rusia; Valeriy Stolyarov, Private Jt.St.Co.“Elscort”, Rusia; Zorigt Ganbaatar and Lodoi Delgerbat, Erdenet Mining Corporation, Mongolia.</i></p>	<p>12:00-12:20 Simple Improvement of Control of the Electromechanical Screwdown System. <i>Pavel Ettler, COMPUREG, Czech Republic.</i></p>
<p>12:20-12:40 Dynamic and Steady Behavior of Harmonic Filter for Compensating Resonance in Mining Systems. <i>Jorge Pontt, José Rodríguez, Juan San Martín, Ricardo Aguilera and Hernán Robles, Universidad Técnica Federico Santa María, Chile</i></p>	<p>12:20-12:40 Input Weighted Data Granulation Using Hybrid Correlation Measures With Application to Metal Properties. <i>George Panoutsos, Mahdi Mahfouf, Qian Zhang and Sid-Ahmed Gaffour, The University of Sheffield, United Kingdom.</i></p>

12:40 - 14:00 LUNCH, MARÍA LUISA BOMBAL BALLROOM.

JOSE FRANCISCO VERGARA B BALLROOM - 16 October	JOSE FRANCISCO VERGARA C BALLROOM – 16 October
<p>Session 9. Ore Processing: Instrumentation 2. Chair: Aldo Cipriano, Pontificia Universidad Católica, Chile.</p>	<p>Session 10. Mining: Instrumentation and Communications. Chair: Walter Grote, Universidad Técnica Federico Santa María, Chile.</p>
<p>14:00-14:20 Design of Mass Flowrate Estimators for n-products Plants. <i>Daniel Hodouin and Éric Poulin, Université Laval; Luc Lachance, Algosys Inc, Canada.</i></p>	<p>14:00-14:20 Reflectance Spectrum Based Classification of Ore. <i>Janne Pietilä and Olli Haavisto, Helsinki University of Technology, Finland.</i></p>
<p>14:20-14:40 On-Line Bubble Size Analyzer for Collection Zone in Industrial Flotation Machines. <i>Claudio Acuña and José Borjas, Universidad Católica del Norte; Rodrigo Duarte, IMASERV, Chile.</i></p>	<p>14:20-14:40 A Vision Based Wheel Slip Estimation Technique for Mining Vehicles. <i>Xiaojing Song, Lakmal Seneviratne and Kaspar Althoefer, King’s College London, United Kingdom.</i></p>

JOSE FRANCISCO VERGARA B BALLROOM - 16 October	JOSE FRANCISCO VERGARA C BALLROOM – 16 October
<p>14:40-15:00 The Online Determination of Bubble Surface Area Flux Using the CiDRA GH-100 Sonar Gas Holdup Meter. <i>Peter Amelunxen</i>, Amelunxen Mineral Engineering Ltd, Chile; <i>Paul Rothman</i>, CiDRA Minerals Processing, USA.</p>	<p>14:40-15:00 SOMI: Towards a Standard Representation of Mining Objects. <i>Patricio Inostroza</i>, <i>Ana Pezo</i> and <i>Andrea Nieto</i>, Universidad de Chile, Chile.</p>
<p>15:00-15:20 Bubble Size Analysis and Boundary Conditions for Automatic Control of Industrial Flotation Cells. <i>Luis Vinnett</i>, <i>Felipe Contreras</i> and <i>Juan Yianatos</i>, Universidad Técnica Federico Santa María, Chile.</p>	<p>15:00-15:20 Wireless SISO Channel Propagation Model for Underground Models. <i>Walter Grote</i>, Universidad Técnica Federico Santa María, Chile.</p>
<p>15:20-15:40 Soft-Sensor Estimation of an Apatite Thickener Operation at the Siilinjärvi Concentrator. <i>Antti Remes</i> and <i>Heikki Koivo</i>, Helsinki University of Technology; <i>Jarmo Aaltonen</i>, Yara Finland-Siilinjärvi Mine, Finland.</p>	<p>15:20-15:40 Improving Situation Awareness in Mining Applications with a High Integrity Collision Avoidance System. <i>Stewart Worrall</i>, <i>David Orchansky</i> and <i>Eduardo Nebot</i>, University of Sydney; <i>Victor Schweikart</i>, Rio Tinto, Australia.</p>

15:40 - 16:20 POSTER SESSION AND COFFEE BREAK, JOSÉ FRANCISCO VERGARA A BALLROOM AND FOYER, LEVEL Z.

JOSE FRANCISCO VERGARA B BALLROOM - 16 October	JOSE FRANCISCO VERGARA C BALLROOM – 16 October
<p>Session 11. Ore Processing: Grinding 2. Chair: Oswaldo Bascur, OSIssoft, USA.</p>	<p>Session 12. General: Monitoring and Operations. Chair: Sirish Shah, University of Alberta, Canada.</p>
<p>16:20-16:40 Simulation of Grain Exposure of Ground Ore Using Voronoi Tessellation. <i>Reza Khalesi</i>, <i>Claude Bazin</i>, <i>Daniel Hodouin</i> and <i>Steve Bellec</i>, Université Laval, Canada.</p>	<p>16:20-16:40 Intelligent Asset Performance Management of a Uranium Solvent Extraction Circuit. <i>Yvonne Power</i> and <i>Andrew Barnfield</i>, BHP Billiton; <i>Jacek Narozny</i>, SGS Advanced Systems, Australia.</p>
<p>16:40-17:00 Collaboration at the Enterprise Using Real Time Data Analysis: From Data to Action. <i>Oswaldo Bascur</i> and <i>Curt Hertler</i>, OSIssoft, USA.</p>	<p>16:40-17:00 Application of Inductive Monitoring System for Equipment Condition Monitoring. <i>Enayet Halim</i>, <i>Harigopal Raghavan</i> and <i>Sirish Shah</i>, University of Alberta, Canada.</p>
<p>17:00-17:20 Conveyor Belt Scales in Mining: Best Practice Installation, Calibration and Maintenance. <i>Sheldon Shepherd</i>, Siemens, Germany.</p>	<p>17:00-17:20 Outliers Detection in Environmental Monitoring Data. <i>Hugo Garces</i> and <i>Daniel Sbarbaro</i>, University of Concepcion, Chile.</p>
<p>17:20-17:40 Robust Multivariable Predictive Control Strategy on Sag Mills, Codelco Chile - Division El Teniente. <i>José Gatica</i> and <i>José Olivares</i>, Honeywell; <i>Benjamín Ramos</i> and <i>Juan Villalobos</i>, Codelco, Chile.</p>	<p>17:20-17:40 Collaboration with the Operator in Focus. <i>Per Lundmark</i>, ABB, Sweeden; presented by <i>Eduardo Rimoli</i>, ABB, Argentina.</p>

JOSE FRANCISCO VERGARA B BALLROOM - 16 October	JOSE FRANCISCO VERGARA C BALLROOM – 16 October
<p>17:40-18:00 Implementation of Multivariable Controller for Grinding - Classification Process. <i>Luis Nieto, José Olivares and José Gatica, Honeywell; Benjamín Ramos and Hugo Olmos, El Teniente, Codelco, Chile.</i></p>	<p>17:40-18:00 Development of a Modular Control System for the Mining Industry Applied to a Computer Vision System. <i>Cristian Medina, Leonardo Basaúl, Víctor Fernández, Francisco Calderón, Luis Baeza and Felipe Ramírez, MI Robotic Solutions S.A., Chile.</i></p>

<p>18:00 CLOSING CEREMONY. JOSÉ FRANCISCO VERGARA BALLROOM A. <i>Víctor Babarovich, Technical Coordinator, IFACMMM 2009.</i> <i>Carlos Barahona, Executive Director, IFACMMM 2009.</i> <i>Luis Bergh, IPC Chair IFACMMM 2009.</i></p> <p>18:15 FAREWELL COCKTAIL – Foyer, Level Z.</p>

STUDENT'S POSTER SESSION

- Automated Petrophysical Characterisation of Drill Cores as a Link to Mineral Processing Attributes.**
Adel Vatandoost, University of Tasmania, Australia.
- Bed Mass Control Loop for CCD Thickeners to Improve the Mineral Washing Efficiency in Gold Mill - Yanacocha Mining Company.**
Alberto Cornejo, Católica de Santa María University, Peru.
- Relating the Froth Velocity with Froth Transport of Industrial Flotation Cells.**
Felipe Contreras, Universidad Técnica Federico Santa María, Chile.
- Monitoring and Diagnosis of a Pilot Flotation Column Using Dynamic PCA Models.**
Fernando Cornejo, Universidad Técnica Federico Santa María, Chile.
- Soft sensors design in a sulphur recovery unit.**
Hugo Garces, University of Concepcion, Chile.
- Correlating Industrial Flotation Froth Characteristics with Operating Variables.**
Humberto Cabrera, Universidad Técnica Federico Santa María, Chile.
- Flotation froths characterization in a bi-dimensional prototype cell.**
Julio Leiva and Luis Vinnett, Universidad Técnica Federico Santa María, Chile.
- Building a Concentrate Grade Soft Sensor based on PLS.**
Víctor Nakagawa, Universidad Técnica Federico Santa María, Chile.