ONLINE TECHNICAL COURSES PRIOR TO TAILINGS

Santiago, Chile Time Zone. GMT -4 | Free Access for Participants

Thursday, August 28

10:00 – 12:00

ENG

Key Challenges in Filtered Tailings: Process, Stability, and Environmental Risk

Joe Scalia, Associate Professor, Colorado State University, USA; Linda Figueroa, Professor, Colorado School of Mines, USA; and Todd Wisdom, Principal Consultant (Non-Conventional Tailings), SRK Consultants. USA

TAILINGS CENTER

Friday, August 29

2:00 pm – 4:00 pm

SPA

Water Management and Balance in Tailings Deposits

Álvaro Ossandón and Gonzalo Suazo, Academics, Departamento de Obras Civiles, Universidad Técnica Federico Santa María, Chile

UNIVERSIDAD TECNICA FEDERICO SANTA MARIA

Monday, September 1

4:00 pm – 7:30 pm

SPA ENG

Chemistry of Tailings Water: What Determines It? What Does It Tell Us?

David Rubinos, Nicolás Orellana, and Jacques Wiertz, SMI-ICE, Chile; and Mansour Edraki, SMI, University of Queensland, Australia

THE UNIVERSITY OF QUEENSLAND AUSTRALIA
SMI ICEChile

COURSE 1: Key Challenges in Filtered Tailings: Process, Stability and Environmental Risk

Joe Scalia, Associate Professor, Colorado State University, USA; **Linda Figueroa**, Professor, Colorado School of Mines, USA; and **Todd Wisdom**, Principal Consultant (Non-Conventional Tailings), SRK Consultants. USA

WHEN	LANGUAGE	LENGHT
Thursday August 28	English	10:00 – 12:00 (2 hours)

DESCRIPTION

As the use of filtered stacked tailings in mining continues to advance so too does our knowledge of the potential challenges to the viability, physical stability, and chemical stability of filtered tailings stacks. This virtual short course, led by the Tailings Center, will briefly introduce participants to the concept of filtered stacked tailings, and then dive into key challenges based on recent learnings. Challenges covered will include the viability of the filtration process at different scales, ensuring dilative conditions within the stack during and after construction, and managing environmental challenges that come with unsaturated tailings.

GENERAL OBJETIVES

1. Understand factors affecting filtration efficiency at various scale.
2. Evaluate geotechnical challenges related to achieving and maintaining dilate conditions in filtered tailings stacks.
3. Recognize geochemical risks associated with unsaturated tailings and strategies for managing long-term environmental stability.

CONTENT AND PROGRAME

10:00 - 10:10	**Introductions, Overview, and Learning Objectives**	Joe Scalia
10:10 - 10:20	**High level overview of filtered tailings**	Joe Scalia
10:20 - 10:45	**Process Challenge: Viability**	Todd Wisdom
10:45 - 11:10	**Geotechnical Challenge: Staying Below the Critical State Line**	Joe Scalia
11:10 - 11:35	**Geochemical Challenge: Unsaturated Tailings**	Linda Figueroa
11:35 - 11:50	**Questions & Discussion**	All
11:50 - 12:00	**Close Out**	Joe Scalia

CAPSULA BIOGRAFICA DEL INSTRUCTORES

Joe Scalia, Ph.D. – Associate Professor, Colorado State University, USA

Joe Scalia is an Associate Professor in the Department of Civil & Environmental Engineering at Colorado State University specializing in tailings and mine waste research and education. He is the CSU Site Director of the Tailings Center. In 2024, he was the co-chair of the Tailings & Mine Waste (TMW) Conference in Denver, CO, which he will again co-chair TMW in 2026. He has authored over 70 peer reviewed publications and is an associate editor for the Journal of Geotechnical & Geoenvironmental Engineering and Geotextiles & Geomembranes, as well as an editorial board member of the Canadian Geotechnical Journal and Geosynthetics International. Prior to joining Colorado State University, Joe was a Senior Associate in the Environmental and Earth Science Practice of Exponent.

Linda Figueroa, Ph.D., P.E. – Professor, Colorado School of Mines, USA

Linda Figueroa is a Professor of Civil, Environmental and Mining Engineering at the Colorado School of Mines. Prior to joining Mines she worked in the civil infrastructure group of DMJM and the environmental engineering group of Parsons Engineering Science. She is a registered Civil Engineer with more that 40 years of experience in civil/environmental/mining engineering, water and wastewater technologies, applied microbiology, and the chemistry and management of metals and radionuclides in the environment. She has taught over twenty different courses over her career from biology to nuclear stewardship and fundamentals of civil and environmental engineering. She has advised over 40 graduate student theses/dissertations and published over 100 technical publications.

Todd Wisdom – Principal Consultant (Non-Conventional Tailings), SRK Consulting, USA.

Todd has 30+ years of experience in mining and energy industries. He is skilled in the selection, design, commissioning, and operation of tailings/mineral processing systems and equipment. During the last 10 years he has focused on the processing, dewatering, transport, and deposition of mineral tailings. He has managed the development, evaluation, and application of multiple innovative tailings technologies. These include processes such as EcoTails® and GeoStableTM co-mingling with waste rock, coarse particle flotation processing/transportation and equipment such as very large format filter presses. He is a team player who can manage a P&L, drive R&D initiatives, manage budgets, lead multi-disciplinary teams, and implement global oriented business strategies.

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COURSE 2: Water Management and Balance in Tailings Deposits

Álvaro Ossandón and **Gonzalo Suazo**, Academics, Departamento de Obras Civiles, Universidad Técnica Federico Santa María, Chile

WHEN	LANGUAGE	LENGHT
Friday, August 29	Spanish	2:00 pm – 4:00 pm (2 hours)

DESCRIPTION

Course focused on techniques and tools for efficiently managing water in tailings deposits, considering operational, environmental, and regulatory aspects.

LECTURERS BIO

Gonzalo Suazo – Professor, Departamento de Obras Civiles, Universidad Técnica Federico Santa María, Chile

Gonzalo Suazo is a civil engineer from the Federico Santa María Technical University, where he currently works as a professor in the Department of Civil Engineering. His specialty is geotechnical engineering applied to mining, with a focus on the stability and management of tailings deposits. He has participated in various research and industry collaboration projects, notable for his work in monitoring technologies and geotechnical modeling.

Álvaro Ossandón – Professor, Departamento de Obras Civiles, Universidad Técnica Federico Santa María, Chile

Álvaro Ossandón holds a degree in Civil Engineering and a Master's degree from UTFSM, as well as a PhD in Civil Engineering from the University of Colorado Boulder. He is a professor at UTFSM and his work focuses on hydrological modeling, flow forecasting, and statistical analysis applied to the water cycle.

COURSE 3: Chemistry of Tailings Water: What Determines It? What Does It Tell Us?

David Rubinos, **Nicolás Orellana** and **Jacques Wiertz,** SMI-ICE, Chile; and **Mansour Edraki**, SMI, The University of Queensland, Australia

WHEN	LANGUAGE	LENGHT
Monday, September 1	English and Spanish	4:00 pm – 7:30 pm (3.5 hours)

DESCRIPTION

While the physical stability of tailings deposits remains a central concern for most mining operators, the issue of chemical stability has been gaining increasing interest due to the environmental risks it may pose and the high costs involved in controlling drainage and infiltration during the operation and closure stages of the deposits.

Due to environmental commitments and because standards require it, efforts to study the water in tailings deposits and their surroundings have increased in recent years. In this regard, water samples are taken and analyzed from the clear water lagoon, drains, ditches, and surrounding wells, but little use is made of the valuable hydrochemical information generated. Although this information is reported to demonstrate compliance with environmental commitments, there is little clarity regarding the interpretation of the results of these analyses, and there are opportunities to incorporate them as tools to support tailings management.

In this workshop, we will address the hydrogeochemical processes that determine water quality in mining tailings deposits, integrating the influence of factors such as fresh water quality (make-up), the addition of reagents (for pH adjustment, flotation reagents, etc.), water-tailings interactions, oxygenation, the presence of microorganisms, and the recirculation rate, among others. We will analyze the operational and environmental implications of the evolution of water quality in these deposits, considering processes such as precipitate formation in the drainage system, ion exchange, pore water retention, sulfide oxidation, and neutralization reactions, which explain the differences in hydrochemistry between the clear water pond and the drains. In addition, the sensitivity of the system to changes in the water regime and in the mineralogy of the processed minerals will be analyzed.

The regulatory framework established in Chile by Exempt Resolution No. 31 of the SMA, which requires continuous monitoring and periodic sampling of multiple physicochemical parameters, has generated a large amount of data. However, this regulation does not specify any limits within which the monitored parameters should fall. This workshop will discuss how to use and interpret the information generated by hydrochemical monitoring of tailings ponds, using simple tools that allow us to understand the processes at work and predict future developments under different short- and long-term scenarios.

The workshop will provide theoretical and methodological bases for the evaluation and control of water chemistry in tailings deposits, aimed at strengthening preventive management and the chemical stability of the deposits.

GENERAL OBJETIVES

1. Identify and analyze the main hydrogeochemical processes that control water quality in tailings deposits, including sources of inflow, water-mineral reactions, and operational conditions, incorporating the temporal variability of the system.
2. Interpret the information generated by periodic monitoring and sampling of tailings water (particularly within the framework of Exempt Resolution No. 31 of the SMA), identifying limitations, trends, and applications for water management and modeling in tailings deposits.
3. Evaluate the impact of operational changes and hydrogeochemical processes on the physicochemical and environmental stability of tailings deposits, focusing on processes such as precipitation in drainage systems, the chemical and mineralogical characteristics of tailings, and variability in process water quality.

CONTENT AND PROGRAME

16:00 - 16:05	**Welcome words – Introduction**	David Rubinos
16:05 - 16:45	**Module 1 – Hydrogeochemistry of tailings – Basic concepts**	Jacques Wiertz Mansour Edraki
16:45 - 16:55	Questions and Discussion Module 1	
16:55 – 17:35	**Module 2 – Hydrochemical monitoring: Where to sample and measure? What to measure? How to interpret the results?**	Nicolás Orellana Jacques Wiertz
17:35 - 17:45	Questions and Discussion Module 2	
17:45 - 18:00	Break	
18:00 - 18:40	**Module 3 – Chemical Stability Management**	Jacques Wiertz
18:40 - 18:50	Questions and Discussion Module 3	
18:50 - 19:00	**Conclusions and Course Closing**	David Rubinos

LECTURERS BIO

David Rubinos – Scientific Leader SMI-ICE Chile

David holds a Bachelor's and Doctorate in Pharmacy from the University of Santiago de Compostela (Spain), with a specialization in Ecology and a postgraduate degree in Soil and Water Quality from the Institute for Food Research and Analysis at the University of Santiago de Compostela (Spain). David has been part of the SMI-ICE-Chile team since 2018, where he currently holds the position of Scientific Leader of the Center. David has more than 25 years of experience in scientific research, during which time he has participated in various national and international projects and authored numerous scientific articles in indexed journals. His main lines of research include (bio)geochemistry, (eco)toxicology, and the risks to human health from arsenic and other toxic elements in environmental systems; the chemical stability and reuse of mining waste (especially Cu tailings and red mud from bauxite); the removal of toxic metals and metalloids in water and effluents, the (bio)remediation of contaminated water and soil, and the impacts of particulate matter on the environment and communities.

Jacques Wiertz – Leader of the Environmental Rehabilitation and Ecosystem Dynamics Team – SMI-ICE Chile

Jacques is a Civil Engineer and Geologist from the University of Liège, Belgium, with a PhD in Applied Sciences from the same university. He has over 25 years of experience in the mining industry as a Research Engineer, academic, and consultant, committed to sustainability. His main areas of expertise are biohydrometallurgy/biolixiviation, environmental impact assessment studies for mining projects, mine closure planning, water management, geochemical characterization of mining waste, and chemical stability of tailings deposits. His areas of interest are sustainable mining waste management, water management, the circular economy in the mining industry, and sustainability indicators for the mining industry.

Mansour Edraki - Group Leader - Environmental Geochemistry CWiMI – SMI The University of Queensland, Australia

Mansour joined the University of Queensland (UQ) in 2000, after completing his PhD at the University of New England. Previously, and before emigrating to Australia in the mid-1990s, he was a professor of earth sciences. Since joining UQ, Mansour has focused on developing innovative techniques to understand and predict the geochemical processes that underpin the sustainable management of mine waste and water, particularly acid and metal-bearing drainage.

Nicolás Orellana – Junior Researcher, Environmental Rehabilitation and Ecosystem Dynamics Team – SMI-ICE Chile

Nicolás is a geologist from the University of Chile, with a diploma in Mining Environmental Liability Management from the Mining and Metallurgical Industry at Andrés Bello University, and a diploma in Environmental Geochemistry Applied to Mining from Mayor University. He has previous experience in geological exploration, metal mining, water resource consulting, and lithium brine projects. He currently works on projects related to hydrogeochemistry, massive mining waste, and environmental geology applied to mining.