

# MINING 4.0

## ROADMAP FOR THE FUTURE

8-9 NOVEMBER 2022  
BARCELONA, SPAIN

### PROGRAM HIGHLIGHTS

- *New Technologies in Exploration*
- *Digital Twins*
- *Connected Mine*
- *Data-Driven Technologies Enabling Emission Reduction*
- *Analytics, Cloud & Big Data*



### Industries Attending



*Infrastructure  
Developers*



*Information  
Technology  
and Software*



*Metal  
& Mining  
Operators*



*Mining Technology  
& Machinery  
Companies*

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## About:

*Mining 4.0 is aimed at bringing together the senior decision-makers from the metals and mining industries for a two-day business networking event, scheduled for November 2022, in Barcelona, Spain.*

*The mining industry is on its way to a transformation to smart, digitized, and decarbonized mining. There is a need for production cost optimization, changes in the mining landscape, and a reduction in human intervention.*

*More sustainable use of resources and an increase in productivity while decreasing input costs comes with digitalization. The shift to smart work and capitalization on the full potential of digital technologies and holistic data strategies comes with automation and delivers operation-wide benefits. In fact, maximizing productivity and optimizing CAPEX, increasing safety and collaboration, decarbonization, and more sustainable practices are just a few of the benefits that digital, intelligent mines and mining operations bring to the industry. For instance, McKinsey estimates that the implementation of digital technologies will help the mining industry save over \$373 billion by 2025 by raising productivity, reducing waste, and keeping mines safe.*

*Growing sophistication comes with the application of artificial intelligence, industrial Internet, cloud platform, digital twin, big data, robotics technology, private LTE and 5G, as well as drones and unmanned data collection technology. All of the given digital instruments are bringing the mining industry closer to intelligent unmanned mining.*

*This edition is aimed at finding new ways to increase the production rate of mining operations, reducing the cost per tonne produced, extending the life span of mine sites, creating a roadmap for unmanned mines, diagnosing which assets are fit for implementing practices aimed at automation and digitalization, as well as learning about the technologies, and overcoming infrastructural challenges associated with adopting these practices at scale.*

## Who Should Attend?

**VPs, CEOs, CTOs, CIOs, MDs, Directors, Heads, and Managers who are responsible for:**

- Mine Planning
- Green / Sustainable Technologies
- Asset Management
- Asset Development
- Infrastructure Development
- Operations
- Fleet and Mobile Technology
- Technical & Sustainability
- Geology & Exploration Production
- Underground Mine
- Open-pit Mine
- R&D
- Automation
- Data Management
- Digitalization
- Digital & Innovation
- Technology Development
- Data Science
- Advanced Analytics
- IoT
- Maintenance
- Digital Transformation
- Technical Services
- Business Intelligence
- Information Technology



# Speakers

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**Bernardo Marinho**  
Business Development,  
Sales Manager  
Siemens



**Dr. Ali Soofastaei**  
AI Program Leader  
Vale



**Rolf Kuby**  
Director General  
Euromines



**Matthias Siefert**  
Head of Competence Center Mining  
Omya



**Christian Spano**  
Director of Innovation  
International Council on Mining and Metals - ICMM



**Rainer Westermann**  
Group Geology & Mining Director  
Lhoist



**Mladen Nedkov**  
Deputy IT Director  
Ellatzite-Med AD



**Maria Sunér**  
CEO  
SveMin



**Médéric Suon**  
IROC Project Leader  
Manager  
Société Le Nickel



**Nicolás Tagle**  
Head of Advanced Analytics  
at Minera Los Pelambres  
Antofagasta Minerals



**Jordi Puig**  
Head of Mining Technology  
(R&D)  
LKAB



**Lorraine Berthet**  
Head of Section, Kevitsa Mine Geology  
Boliden



**Denis Richard**  
Senior Expert Mine Innovation  
Eramet Ideas



**Tita Nurmi \***  
Chief Information Officer  
Nordkalk Corporation



(Pending Internal Confirmation)



**Christophe Delneuve**  
Senior Mining Engineer  
Lhoist



**Nancy Guay**  
Vice President Technology,  
Optimization & Innovation  
Agnico Eagle Mines



**Elen Toodu**  
Director, Global Automation  
Product Line and Projects  
Sandvik



**Elizabeth Renaud**  
Project Manager Innovation 4.0



**Ruben Claessens**  
Digital Lead Industry 4.0  
Carmeuse



75%  
3/4

# Summit Schedule

## Day 1

8 November

**8:55** - Opening address from the organizer

**9:00 - ONLINE KEYNOTE PRESENTATION**  
**DIGITAL TRANSFORMATION IN MINING: OPPORTUNITIES AND CHALLENGES**

**Dr. Ali Soofastaei**  
 AI Program Leader

**Vale**

**9:30 - ONLINE PRESENTATION**  
**DIGITAL TRANSFORMATION IN THE MINING INDUSTRY - ERAMET SLN JOURNEY SO FAR**

- ERAMET SLN digital transformation roadmap
- First initiatives (through drones, IoT, and data science)
- Which of the initiatives will be gathered in the IROC dynamic?
- Feedback from the People/Process/Technology challenges

**Médéric Suon**  
 IROC Project Leader Manager

**Société  
 Le Nickel**

**10:00 - VENDOR SESSION**  
**TECHNOLOGY DRIVEN EXPLORATION**

- Geotechnical surveying with lidar-equipped drones and drone technology for effective mine surveillance
- Measurement of magnetic tensor data for geophysical exploration with airborne SQUID technologies
- Downhole geophysical data acquisition
- Computer vision techniques in augmentation and automation of drill core logging
- Automated resource modeling based on geological data

*Applicable for: Drone technology vendors / SQUID technology vendors / Traceability & Reportability vendors / 3D modelling vendors / Data driven exploration vendors*

**10:30 - Coffee & Networking Break**

**11:10 - PROBLEMS AND OPPORTUNITIES OF REMOTE PERFORMANCE TRACKING OF MINE OPERATIONS ON A GLOBAL SCALE**

*The performance evaluation of mobile equipment is one key parameter for an efficient and sustainable operation of a mine. Especially for small-scale operations, the evaluation and analysis of these parameters are very difficult because of the very limited resources. The paper will present the way, Omya has chosen to evaluate and analyze these data remotely via a brand-new system 100% independent from the machine supplier. Advantages and disadvantages will be shown as well as current limitations and further planned developments.*

**Matthias Siefert**

Head of Competence Center Mining **Omya**

**11:40 - FUTURE OF MINE AUTOMATION – OPPORTUNITIES AND CHALLENGES**

- Current status of the market
- Sandvik's view of the future of Mine automation
- Key Factors of Success when implementing Technology
- Example delivery projects and case story

**Elen Toodu**

Director, Global Automation Product Line & Projects

**Sandvik**

**12:10 - DIGITALIZATION IN MINING INDUSTRY – PIT TO PORT OPTIMIZATION**

- Challenges in integrating long and complex value chains in mining
- Siemens's digital architecture vision to guide digital transformation in mining
- Success stories: Application of key digital technologies to enable pit-to-port optimization

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**Bernardo Marinho**

Business Development, Sales Manager **Siemens**

**12:40 - Lunch**

**13:40 - LKAB TRANSFORMATION TOWARDS A SUSTAINABLE FUTURE**

- Climate change creating opportunities. Being part of the solution
- Our climate impact today
- Taking a step forward in the value chain
- Three areas leading our transformation
  - 1 New world standard for mining
  - 2 Carbon-free sponge iron
  - 3 Critical minerals
- Alone is not strong

**Jordi Puig**

Head of Mining Technology (R&D)

**LKAB**

**14:10 - IDENTIFYING, DEVELOPING AND IMPLEMENTING AUTOMATION ACTIVITIES IN THE MINING OPERATION**

**Nicolás Tagle**

Head of Advanced Analytics

**Antofagasta  
 Minerals**

**14:40 - VENDOR SESSION**

**AUTOMATION, ROBOTICS & ML LEARNING TECHNOLOGIES FOR STATIONARY / NON-MOBILE MINING MACHINERY**

- In-pit crushing
- Drilling fluid automation system
- Sensor-based ore sorting
- Automatization of blasting activities

*Applicable for: Mining & Rock solution vendors / Drilling & Blasting vendors / AI, robotic automation & ML vendors*

**15:10 - Coffee & Networking Break**

**15:50 - BLAST MOVEMENT MONITORING AT BOLIDEN KEVITSA MINE FOR ORE AND WASTE CONTROL: FROM 2D TO 3D SOLUTION, IMPACT ON SAFETY, PRODUCTION EFFICIENCY AND ENVIRONMENTAL FOOTPRINT.**

- 2D method problems
- Considered advanced methods
- Implementation challenges
- Results
- Next steps

**Lorraine Berthet**

Head of Section, Kevitsa Mine Geology **Boliden**

**16:20 - DATA FABRIC LAYER (DFL) AS A BASIS FOR YOUR DIGITALIZATION JOURNEY**

- How can DFL provide the flexibility you need in data management?
- How can DFL provide top-to-bottom transparency in your data?
- How can DFL provide a unified user experience?
- How can DFL be human-centered solution cutting human-driven data management tasks in half?
- How can DFL provide the sustainability you need for future-proof continuous improvement?

**Ruben Claessens**

Digital Lead Industry 4.0

**Carmeuse**

**16:50 - PANEL DISCUSSION**

**Advocating for the adoption of zero entry mining systems**

**17:40** - End of the Day 1

# Summit Schedule

## Day 2

9 November

**8:55** - Opening address from the organizer

**9:00** - CHALLENGES IN IMPLEMENTATION AND OPERATION OF A REMOTE OPERATING CENTRES (ROC)

**9:30** - HOW PROGRAMMING WITH OPEN-SOURCE PACKAGES CAN HELP INCREASE PRODUCTIVITY AT ERAMET

A SMALL TEAM OF DATA SCIENTISTS WITH A STRONG MINE AND GEOLOGY BACKGROUND IS USING OPEN-SOURCE PYTHON LIBRARIES

- Small scale data science applications for specific operational needs
- A fast and efficient response to the problem

SOME EXAMPLES OF APPLICATIONS

- Limagna project which optimizes streams and processes from Mine to port, and is to be implemented in the IROC
- SDM prod + which optimizes the supplementary dry mining sequence and moves of the slurry plant
- NiLime which provides a cloud interface across the Group to automate the resource estimation process and provide a platform for user defined routines

LIMAGNA, FUTURE PART OF IROC

GCO, DREDGE MINING WITH THE DEVELOPMENT OF SPECIFIC TOOLS TO IMPROVE MINE PLANNING

NI LIME, DEVELOPMENT OF A PLATFORM FOR RESOURCES CALCULATION AT SLN, CUSTOMISATION THROUGH PYTHON FOR GEOS

Denis Richard  
Senior Expert Mine Innovation

Eramet  
Ideas

**10:00** - VENDOR SESSION

PREDICTIVE MAINTENANCE & CONDITION MONITORING SOLUTIONS

- Automated scheduling of mining operation tasks
- Mitigating process interruptions by using predictive technologies
- Smart Fleet Management Systems
- V2X System

Applicable for: Intelligent mining software providers / Predictive maintenance vendors / AI and ML vendors

**10:30** - Coffee & Networking Break

**11:10** - ENDEAVOUR MINING DIGITAL TRANSFORMATION JOURNEY

- Achievements
- Transformation steps
- Digital Roadmap view and principle
- Key Lessons Learned
- Use Case Example

Elizabeth Renaud  
Project Manager Innovation 4.0

Endeavour Mining  
Corporation

**11:40** - MINES SUPPORT AND OPTIMIZATION - MINE TECHNICAL STANDARDS DEFINITION - TECHNICAL REVIEW AND ASSISTANCE OF A CAPITAL PROJECT

Christophe Delneville  
Senior Mining Engineer

Lhoist

**12:10** - VENDOR SESSION

DATA PROCESSING AND ANALYTICS SYSTEMS AS A ROUTE TO MINE CONNECTIVITY AND AUTONOMY

- Cloud computing technology
- Multi-criteria intelligent evaluation and decision-making powered by AI to enhance safety in operations
- Simulation of data flows and scenarios, untestable in the physical testbed with the help of virtual test mine

Applicable for: Intelligent mining software providers / Cloud service providers

**12:40** - Lunch

**13:40** - THE NEW APPROACH IN MOBILE INFORMATION AVAILABILITY FOR MINERS AT ELLATZITE-MED AD, BULGARIA

- Data extraction from automation and operational systems
- Security in public mobile information
- Challenges of displaying information

Mladen Nedkov  
Deputy IT Director

Ellatzite -  
Med AD

**14:10** - CASE STUDY Nordkalk Corporation

Tita Nurmi \*  
Chief Information Officer

Pending  
Internal  
Confirmation

Nordkalk  
Corporation

**14:40** - Coffee & Networking Break

**15:20** - PANEL DISCUSSION

What happens beyond automation?

**16:00** - End of the Summit

## Speakers Biographies:



**Jordi Puig**  
Head of Mining  
Technology (R&D)  
**LKAB**

*Jordi Puig is currently the Head of Strategic Projects in the Mining Technology Division at LKAB. Leading a team to deliver solutions for mining our deep deposits sustainably. Jordi started his career in mining in 2003 and has gained experience in different mining companies and mining commodities in Europe, Africa, and South America. Holds a MSc from Western Australia School of Mines and a Mining Engineering Degree from Barcelona Tech and a Environmental Science degree from UA Barcelona.*



**Rolf Kuby**  
Director General  
**Euromines**

*Rolf Kuby has extensive experience with over 22 years in public affairs and EU advocacy and 8 years of active involvement in sustainability strategies. Rolf is also a senior expert in EU Sustainability, Environment, Climate and Energy policies. Rolf's most recent roles were Head of EU Brussels Office of Wirtschaftsvereinigung Stahl and previously Director External Affairs and Head of EU office at Aurubis.*



**Christian Spano**  
Director of Innovation  
**International Council on Mining and Metals - ICMM**

*Christian started his career in Peru and Latin America in the forestry and energy sectors, before moving first to renewables and power and then, for the last ten years, to the mining and metals industry. While working for ICMM member Anglo American, Christian gained experience in working on innovation in a socio-economic development context. This was followed by roles at World Economic Forum and Systemic where Christian focused on business models, regulation and finance. He has also been exposed to impact investing where he has had the chance to support disruptive technologies entering the mining and metals space. Christian is an economist with a MSc degree in International Development from the London School of Economics and a postgraduate diploma in Strategy and Innovation from the University of Oxford. Christian loves cycling and cooking and spending time with his family.*



**Matthias Siefert**  
Head of Competence Center  
Mining  
**Omya**

*Matthias Siefert is a Head of Competence Center Mining in Omya with 29 years of experience in mining. Matthias has a Master's and PhD in Mining and the Rock Engineering from Montan University of Leoben, Austria. In 2003 Matthias has started his work in Omya GmbH Austria being involved in different operational functions (last function: Head of Raw Material Austria). And from 2016 Matthias is the Head of Competence Center Mining responsible for all technical innovations and developments in the field of mining on a global level for the Omya group.*



**Médéric Suon**  
IROC Project Leader  
Manager  
**Société Le Nickel**

*Médéric Suon is an industrial engineer by training with a PhD in computer sciences. He started his career in the automotive industry and discovered in 2012 the mining industry at ERAMET SLN in New Caledonia in different Financial, Performance and Innovation roles. Former Chief Digital Officer of SLN, he's now in charge of the IROC initiative.*



## Speakers Biographies:



**Rainer Westermann**  
Group Geology & Mining Director  
Lhoist

Rainer Westermann is the Director of Geology & Mining at Lhoist Group with over 30 years of experience in the mining industry. He graduated in 1990 with a Master of Science in Mining and Engineering from the Clausthal University of Technology in Germany. After graduation, Rainer worked with Wülfraht Refractories as an Operational Engineer in Hagen-Halden, Germany. He then moved into the role of a Mine Planner for the Wülfraht group of companies, in 1994 he started to manage a team of Geologist and Mine Planners supporting the German plants. In 1999 he became the Managing Director of a Dolomite Plant with an underground mine in Germany. In July of 2009, Rainer moved to Texas after his promotion to Director of Mining and Exploration for Lhoist North America. After 7 years in the US, he relocated to the Lhoist HQ in Limelette/Belgium, where he has the role of the Group Geology & Mining Director. His primary responsibility is to secure raw material resources for the plants of the Lhoist Group, ensuring sustainable utilization of reserves and optimizing the mine operations.



**Mladen Nedkov**  
Deputy IT Director  
Ellatzite-Med AD

Mladen Nedkov started his career as a System administrator at Ellatzite-Med AD company in the 2003 year and since then he used to be a Manager of the Informational systems in the mining division and currently is the Deputy IT Director of the company. He used to be an associate assistant at the Technical University of Sofia in the Computer operation systems discipline. His education started at the Secondary school of Computer Science at Pravets town, continuing to the Technical University of Sofia where he graduated with an Informational systems profile in Computer science and technologies faculty. His master's degree is in Business administration graduated from the Technical University of Sofia. Mladen Nedkov successfully accomplished Cisco CCNA course networking. He is also a Microsoft Certified Professional with his knowledge of Windows server Active directory and Microsoft exchange products. Mladen Nedkov is awarded the award Young scientist of 2017 by the Scientific and Technical Union of Mining and Geology. During his career at Ellatzite-Med AD, he has successfully implemented some of the biggest digital innovations at the company. With his project for High-precision guidance of shovels and drills with the ProVision system, Ellatzite-Med AD has been awarded, with the price Innovation of 2016 of the Bulgarian mine chamber." In 2022, the award of the Federation of the scientific engineering unions for Engineer of the 2021 year is given to Mladen Nedkov.



**Loraine Berthet**  
Head of Section,  
Kevitsa Mine Geology  
Boliden

Loraine Berthet is leading the Mine Geology team of Boliden Kevitsa Ni Cu PGE open pit mine in Finnish Lapland. Her goal is to improve ore and waste control via sustainable projects; enabling safer working environment, better operational performance and reduced environmental footprint. With 15 years of experience in the mining industry, she has worked mostly as a resource geologist in U and Ni commodities. Her education background is a MSc degree in Geology from École Nationale Supérieure de Géologie de Nancy (ENSG) and Luleå Tekniska Universitet (LTU).



**Denis Richard**  
Senior Expert  
Mine Innovation  
Eramet Ideas

Denis is a Senior Expert in mining innovation at Eramet Ideas, the Research Centre for the ERAMET mining Group and is involved in various R&D projects for ERAMET. His fields of interest include Geology, Mining and Mineral Processing in various commodities. Denis has more than 20 years of experience in the mining industry, he has a degree from ENSG in Nancy and an MSc in geochemistry from Lorraine University. Currently, in his role, Denis is a project Manager for several Eramet ideas innovative projects, coaching project managers on lean project management. He is an expert in mineral processing and is a lead expert for the Sonic Bay HPAAL project in Indonesia. Denis is a referent for project economic evaluation. In the past, Denis worked as a Project manager for the Népoui mine expansion project in New Caledonia. As well as he was a Head of Mine planning and engineering studies for SLN Mines in New Caledonia and Head of the R&D mineral processing department, with a focus on Nickel, manganese and Niobium commodities.



**Ruben Claessens**  
Digital Lead Industry 4.0  
Carmeuse

Ruben Claessens is civil engineer energy by trade but entered the digital-in-mining world through the Belgian Prince Albert Fund in 2021, working as Digital Lead Industry 4.0 for Carmeuse. Based out of Winchester VA, his ambition is to digitize the core operations following a human-centred approach with a focus on continuous improvement in operational efficiency, reducing cost, improvement of product quality, and pursuing Carmeuse's sustainability goals.

## Speakers Biographies:



**Dr. Ali Soofastaei**  
AI Program Leader

Vale

*Dr. Ali Soofastaei is a global artificial intelligence (AI) industrial projects leader, an educational programs instructor, international keynote speaker, academic editor, and professional scientific author.*

*Dr. Soofastaei has been involved in industrial research and development projects in several industries, including oil and gas (Royal Dutch Shell); steel (Danieli); and mining (BHP, Rio Tinto, Anglo American, and Vale). His extensive practical experience in the industry has equipped him to work with complex industrial problems in highly technical and multi-disciplinary teams. Currently, Ali is leading the Soofastaei-Businesses, an organization focused on digital transformation, practical innovations, and value chain improvement by applying integrated AI solutions.*

*Ali completed his Ph.D. and Postdoctoral Research Fellow at the University of Queensland, Australia, in the field of AI applications in mining engineering, where he led a revolution in the use of Deep Learning and AI methods to increase energy efficiency, reduce operation and maintenance costs, and reduce greenhouse gas emissions in surface mines. In the past 15 years, he has provided practical guidance to postgraduate students in different prestigious universities across the world as a principal industrial advisor.*

*Leading actively industrial analytical based projects in giant industrial companies, designing and presenting innovative educational programs, keynote speaking in important conferences around the world, having more than one hundred published papers, books, and technical documents, and working with prestigious publishers to provide the scientific resources has made him a pioneer leader in creating a digital revolution in industry 4.0.*



**Christophe Delneuve**  
Senior Mining Engineer

Lhoist

*Christophe holds a Mining and Geology Master's degree from the University of Liege, Belgium. With over 15 years of mining experience, he starts his journey in Africa, mainly based in the Democratic Republic of Congo, developing strong analytical and technical skills working in underground and open cast Copper and Cobalt mines of companies like Forrester Group, Metorex and ERG Africa.*

*Before moving back to Belgium, he was leading the Mine Technical Services Department of BossMining (ERG Africa), managing mining engineers and geologists, in areas of expertise such as Surveying, Grade Control, Drill&Blast, short-term Mine planning, Hydrogeology & Geotech, strategic mine planning.*

*Ten years ago, he joined the Lhoist Group, the global leader in lime, dolime and minerals with about 60 mines around the world (mainly Europe, the USA, Latin America and Asia). He has held various positions as Mining Engineer at our Western Europe Regional Head Quarter office, Mine Manager of our main Dolomites Quarry in Belgium and for 4 years, part of the Geology and Mining Group Department, as Senior Mining Engineer.*

*In his position, he is working in close collaboration with the regions, focusing on the support and optimization of the Lhoist mines, helping to define standards and assisting in the technical review of capital projects linked to Lhoist quarries and underground mines. Being based in the Head Quarter of the Group, he coordinates working groups and projects linked to Digital Mining with the goal of harmonizing the processes throughout the Region and avoiding too many local initiatives being done in parallel.*



**Elen Toodu**  
Director, Global Automation  
Product Line and Projects

Sandvik

*Elen is a mining engineer with more than 13 years of experience in both open pit and underground operations.*

*Since 2019 she works for a world-leading mining equipment manufacturer Sandvik in the Digital Mining Technologies Division, currently working as the Director for Global Automation Product Lines, Project Office and Supply Chain. Prior to joining Sandvik, Elen worked for a Canadian Gold Mining Company – Agnico Eagle Mines. She has had several engineering and operational roles both in underground and surface mining and spent 3 years leading the Mine Engineering Department at the Kittilä gold mine.*



**Elizabeth Renaud**  
Project Manager  
Innovation 4.0

Endeavour Mining  
Corporation

*Since a young age, Elizabeth has been passionate about science. This passion later drove her to study engineering at Ecole Polytechnique de Montreal. Graduating in 2010 with a Bachelor's degree in Material Engineering and a Master's in Metallurgy master's, Elizabeth started working in the mining industry, initially as a junior consultant, then progressing up to Chief Metallurgist. In 2020, she moved into the digital world with her appointment as Innovation 4.0 Manager at Endeavour Mining, one of the world's largest gold producers and the largest in West Africa. Undertaking digital transformation at Endeavour is not a trivial exercise, but such a great challenge and one that is taking Elizabeth out of her comfort zone. Since embarking on its digital transformation journey in 2020, Endeavour has defined its vision and ambition for digital and launched six use cases that are already generating value, both in boosting efficiencies as well as reducing costs.*

*Elizabeth now heads the Digital Office, staffed with 15 employees, driving a range of use cases across the Group's six mines in Senegal, Cote d'Ivoire and Burkina Faso. Whilst Endeavour has come a long way in its digital transformation over the past couple of years, for Elizabeth it is only just the beginning.*

