corem

Innovation in mineral processing

Activity report

2022

corem.qc.ca

Messages from the President of the Board and of the CEO

JEAN-FRANÇOIS LEROUX, Eng.
CHAIRMAN OF THE BOARD

FRANCIS FOURNIER, Eng., F.
PRESIDENT AND CEO

The strength of the mining sector continued again in 2022, and several mining companies maintained and accelerated their development projects. This was the case, among others, in the iron ore sector where some companies continued their projects to increase their production capacity and transform their process to improve recovery and the purity of their concentrate, but also to deploy processes that reduce greenhouse gas emissions and the environmental impact of their operations. The undertaking of several projects to develop mines to extract and process critical and strategic minerals has also accelerated, in a context where the federal government and some provinces including Québec have continued to deploy strategies to better control the supply chains of critical minerals. This government commitment supports an ambitious vision of energy transition to a carbon-neutral economy.

Despite a competitive job market where the mining sector is also affected by a labour shortage, we have succeeded in increasing our expertise by recruiting additional qualified personnel, allowing us to adequately meet the needs of our members, clients, and partners. The occupational health and safety of our personnel has remained a priority, in a context where the deposits under development are increasingly complex. It is thanks to our dedicated staff that in 2022 we were once again able to pursue our mission and achieve the goals we set out in our strategic plan.

Our pre-competitive research program remained at the core of our activities. After two consecutive years of high investment in our research program, enabling us, among other things, to support the development of our cyanide regeneration process, investments amounted to $6.4M in 2022. Issues related to the reduction of greenhouse gases, the fight against climate change, and the reduction of the environmental impact of treatment processes are becoming increasingly important in our research program. Moreover, we established an analytics and technology development group to meet the growing needs of our members for intelligent systems development. The economic benefits for every dollar invested by our members in our pre-competitive research program were established at more than $9 at the end of 2022.

We also continued our efforts to develop innovative technologies and processes in collaboration with our research, industry, and government partners. Our partnership with the Ministère de l'Économie, de l'Innovation et de l'Énergie was renewed in the spring of 2022, while we continued our partnership with the Ministère des Ressources naturelles et des Forêts and Canada Economic Development. This latter partnership also allowed us to continue the deployment of our three-year investment plan where the main activities were related to the upgrade of our analytical services laboratory, the purchase of state-of-the-art equipment, and our digital transformation.

In terms of governance, we reviewed our practices for the pre-competitive research committee and established squads to ensure greater agility in the alignment and execution of our research program projects. We also completed the review of our practices in order to adopt the best approaches to the composition, selection, welcoming, and integration of our directors and the evaluation of the Board of Directors. This review also led to the revision of the Board of Directors' committees. It is under the heading of continuous improvement that the Board of Directors, under the chairmanship of Mr. Jean-François Leroux, welcomed three new directors in 2022 and continued its work.

Corem's management would like to thank its staff and directors for their contribution to the success of the organization.

Governance

BOARD OF DIRECTORS
(4 meetings)

Directors

Jean-François Leroux (Chairman of the Board)
Glencore – Raglan Mine

Marc Lafontaine (Vice-Chairman of the Board)
Agnico Eagle

Jean Morissette (Treasurer, Corporate Secretary)
Raymond Chabot Grant Thornton

Jean Châteauneuf
Canadian Malartic GP

Catherine Cobden
Canadian Steel Producers Association (CSPA)

Francis Fournier (President and CEO)
Corem

Angela Hamlyn
Canadian Institute of Mining,
Metallurgy and Petroleum (CIM)

Angela Kourouklis
Quebec Iron Ore

Rémi Lapointe
IAMGOLD Corporation

Guillaume Matton
Niobec

Jean-Paul Ordioni
ArcelorMittal Mining Canada

Rolf Stösser
IOC Mining Company of Canada

André Zaccarin
Université Laval

Observers

Marie-Ève Boucher
Ministère des Ressources naturelles et des Forêts
Gouvernement du Québec

Josée Méthot
Quebec Mining Association

Denise Moranville
Ministère de l'Économie, de l'Innovation et de l'Énergie
Gouvernement du Québec

STRATEGY COMMITTEE
(4 meetings)

Jean-François Leroux (Chairman of the Committee)
Glencore – Raglan Mine

Jean Châteauneuf
Canadian Malartic GP

Angela Kourouklis
Quebec Iron Ore

Marc Lafontaine
Agnico Eagle

Guillaume Matton
Niobec

AUDIT COMMITTEE
(4 meetings)

Jean Morissette (Chairman of the Committee)
Raymond Chabot Grant Thornton

Rémi Lapointe
IAMGOLD Corporation

Jean-Paul Ordioni
ArcelorMittal Mining Canada

Rolf Stösser
IOC Mining Company of Canada

André Zaccarin
Université Laval

MANAGEMENT

Francis Fournier
President and CEO

Sylvie Lévesque
Deputy CEO

Claude Gagnon
Scientific Director – Mineral Processing

Michel Garant
Director – Member and Client Relations

Benoît Levasseur
Scientific Director – Mineral Processing

Nathalie Morneau
Director – Finance and Digital Solutions

Francis Pelletier
Director – Organizational Development and Human Resources

Éric Tremblay
Director – Infrastructure and Operational Planning

PRE-COMPETITIVE RESEARCH COMMITTEE
(3 meetings)

Representatives

Jean-Sébastien Marois (Chairman of the Committee)
Niobec

François Robichaud (Vice-Chairman of the Committee)
Agnico Eagle

Gianni Bartolacci (Vice-Chairman of the Committee)
Rio Tinto, Iron & Titanium

Steve Beaudin
Métal 7

Simon-Pierre Blouin
Niobec

Yves Breau
Kinross Gold

Sandra Côté
Ministère des Ressources naturelles et des Forêts
Gouvernement du Québec

Mayara Camila Duarte de Oliveira
Vale S.A.

Jérémie Gallet
ArcelorMittal Mining Canada

Nijad Hamzeh
IOC Mining Company of Canada

Sebastian Humphrey
Newmont – Éléonore

Blair Kelly
IOC Mining Company of Canada

Rémi Lapointe
IAMGOLD Corporation

François Lavoie
Quebec Iron Ore

Nadia Ouellet
Glencore – Raglan Mine

Stéphane Marcoux-Gagné
Hecla Québec

Jean-Philippe Thivierge
Canadian Malartic GP

Observer

Tony Di Feo
Canmet

Squads

Executive Squad
Leader: Jean-Sébastien Marois (Niobec)

Physical Separation Squad
Leader: Gianni Bartolacci (Rio Tinto, Iron & Titanium)

Comminution Squad
Leader: Jean-Philippe Thivierge (Canadian Malartic GP)

Agglomeration and Thermal Processes Squad
Leader: Blair Kelly (IOC Mining Company of Canada)

Flotation Squad
Leader: Nadia Ouellet (Glencore – Raglan Mine)

Extractive Metallurgy Squad
Leader: Rémi Lapointe (IAMGOLD Corporation)

Logistics / Administrative Squad
Leader: Jérémie Gallet (ArcelorMittal Mining Canada)

Innovative Solutions Squad
Leader: Frank Roberto (Newmont)

Corem, a living environment

In 2022, corporate life gradually resumed. At the beginning of the year, the common areas were once again open, team meetings were able to resume in person, and some corporate social activities were held outside, such as the "BBQ" lunch and volleyball. In the fall, monthly information and exchange meetings with all staff were held in our facilities, which facilitated communication and organizational cohesion. The year ended with the traditional Christmas recognition party.

After more than two years in the pandemic period and the challenges it brought, an organizational survey on employee satisfaction and mobilization was conducted. The results allowed us to target the actions to be implemented in order to ensure the retention and loyalty of our personnel, the main pillar of our value proposition.

Our mission

Create innovative solutions in mineral processing for the benefit of a sustainable mining industry, working closely with our members, our customers, and our partners.

Our services

Adapted to our clients, research and innovation are at the heart of our business model. Supported by our state-of-the-art installations and expertise, our services are offered to our clients under three models:

- Pre-competitive Research Program
- Research and collaborative innovation
- Contractual services

The values that guide us

CREATIVITY

We are working to find possibilities where none are seen: we cultivate the art of doing otherwise.

INTEGRITY

Through the veracity and exactitude of our words and actions, we strive to uphold honesty.

ENGAGEMENT

Our promise to our colleagues, organization, members, and partners is to offer the best of ourselves and to have our actions reflect those intentions.

TEAM SPIRIT

We unite and work together for a common goal in a climate of confidence, openness, and respect.

HEALTH, SAFETY AND SUSTAINABLE DEVELOPMENT

We work toward a safe and healthy workplace and we take actions to be part of sustained development and environmental awareness.

"We had a very big year in 2022, with the rapid redirection of many of our work. Corem has been a partner of choice in the development of our strategic projects by quickly adapting to our demands. The quality of Corem's researchers has greatly contributed to the achievement of excellent results."

– **Christian Rochefort, Eng., M.Sc.**
Expert – Major Projects Management
ArcelorMittal Mining Canada GP

Corem in numbers

$23M
ANNUAL BUDGET

$6.6M
Investment in the pre-competitive research program

$9
Operational benefits per dollar invested by our industry members

220
Technological transfers and contracts

244
Number of projects annually

3
Licensed technologies

3
Patented technologies
(South Africa, Australia, Brazil, Canada and the United States)

Types of ore processed

PRECIOUS METALS | BASE METALS | TITANIUM-BEARING ORES | CRITICAL AND STRATEGIC MINERALS | IRON ORE | MINERALIZED SANDS | INDUSTRIAL MINERALS

Our fields of expertise

COMMINUTION | PHYSICAL SEPARATION | FLOTATION | MINERALURGY ANALYTICS AND TECHNOLOGY | EXTRACTIVE METALLURGY | PELLETIZING AND THERMAL PROCESSES | MINERALOGY

Our members, the core of our organization

AGNICO EAGLE

ArcelorMittal

RioTinto

Newmont ÉLÉONORE

MINERAI DE FER QUÉBEC
QUEBEC IRON ORE

GLENCORE

Hecla QUÉBEC

MINE CANADIAN MALARTIC

VALE

Niobec
UNE COMPAGNIE DE MAGRIS RESOURCES

IAMGOLD CORPORATION

KINROSS

METAL7

MEMBERS

Agnico Eagle
LaRonde Division, Cadillac (Que.)
Goldex Division, Val-d'Or (Que.)
Meadowbank Division, Baker Lake (Nunavut)
Meliadine Division, Rankin Inlet (Nunavut)
Kittila Division, Kittila (Finland)
La India Division, Sonora (Mexico)
Pinos Altos Division, Chihuahua (Mexico)
Detour Lake Division, Cockrane (Ont.)

ArcelorMittal Mining Canada
Mont-Wright Concentrator, Fermont (Que.)
Pelletizing plant, Port-Cartier (Que.)

IAMGOLD Corporation
Westwood Complex, Rouyn-Noranda (Que.)

Glencore Canada Corporation
Raglan Mine, Katinniq (Que.)

Hecla Québec
Casa Berardi Mine, Val-d'Or (Que.)

Kinross Gold Corporation
Paracatu Mine, Paracatu, Minas Gerais (Brazil)

Newmont
Éléonore Project, Rouyn-Noranda (Que.)

Canadian Malartic GP
Canadian Malartic, Malartic (Que.)

Quebec Iron Ore
Bloom Lake Mine, Fermont (Que.)

Niobec
Niobec Mine, Saint-Honoré-de-Chicoutimi (Que.)

Rio Tinto Energy & Minerals
IOC Mining Company
- Concentrator, Labrador City (N.L.)
- Pelletizing Plant, Labrador City (N.L.)

Rio Tinto, Iron and Titanium
- OPP Plant, Sorel-Tracy (Que.)
- QIT Madagascar Minerals, Mandena (Madagascar)

Vale S.A.
Usina 8 – Pelletizing plant, Vitória (Brazil)
Conceição I – Serra do Esmeril Concentrator, Itabira (Brazil)

ASSOCIATE MEMBER

Métal 7
Sept-Îles (Que.)

PARTNERS

RESEARCH

- AMIRA International, Melbourne (Australia)
- Canada Mining Innovation Council (CMIC), Ottawa (Ont.)
- Industrial Residue Technology Center (CTRI), Rouyn-Noranda (Que.)
- Coalia, Thetford Mines (Que.)
- IVADO, Montréal (Que.)
- National Research Council of Canada (NRC)
- Natural Resources Canada (CanmetMINES), Ottawa (Ont.)
- Universities
  - Curtin University, Perth (Australia)
  - British-Columbia, Vancouver (B.C.)
  - École Polytechnique de Montréal (Que.)
  - INRS-ÉTÉ, Québec (Que.)
  - Laval, Québec (Que.)
  - McGill, Montréal (Que.)
  - Queens, Kingston (Ont.)
  - Toronto, Toronto (Ont.)

INDUSTRIAL

- BBA
- BioCarbon Industries
- Draslovka
- Copper Mountain Mining
- Cyanco
- Derrick
- FLSmidth
- H2Flow
- Jumine
- MeGlobal
- Métal 7
- Metcom
- Mining and Process Solutions
- Multotec
- National Carbon
- Newmont, Porcupine Mine
- Outotec
- Paul Wurth
- ThyssenKrupp
- Scantech
- Weir Minerals

Highlights

2019-2023
STRATEGIC PLAN

In 2022, we completed the fourth year of our five-year strategic plan. After prioritizing certain actions from the strategic plan in 2021, we restarted several improvement projects across all facets of the organization, all while remaining aligned with our issues and our two guiding principles:

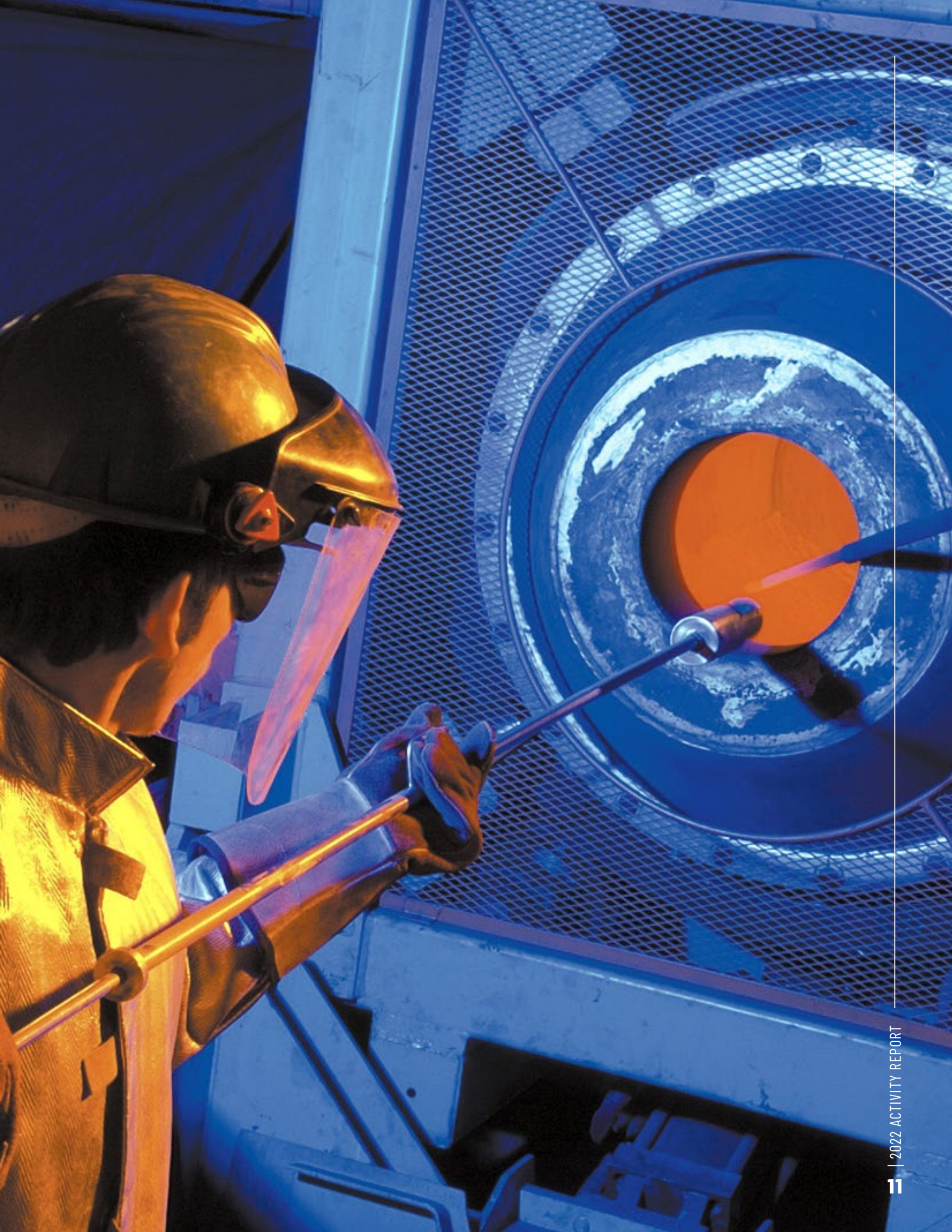
- Develop a culture within the organization focused on service and the top priority of ensuring member and client satisfaction;
- Improve the efficiency of each of our projects and the organization as a whole.

Since our expertise is at the heart of our value proposition, we reviewed our practices and increased our recruitment efforts and conducted an organizational survey. Several actions were also taken to improve operational efficiency. The implementation of a planning tool, the ongoing development of performance indicators, the development of a workbook in connection with the review of our management systems, and the continued deployment of our cybersecurity action plan are a few examples. We have continued our efforts in terms of relations with our members and clients, as well as the development of strategic partnerships and a review of our practices for our pre-competitive research program.

Finally, we reviewed the structure of the management team to better serve our clients and support our growth. Improvements included the creation of a Deputy CEO position and the creation of the role of Director - Infrastructure and Planning.

"Corem played a pivotal role as FPX Nickel transitioned from bench- to pilot-scale test work. Corem's expertise and resources helped to validate our overall flowsheet, but also optimized several parameters which unlocked additional project value. We look forward to continuing our relationship with Corem as we advance the world's first awaruite processing facility toward production, unlocking an advantageous new source of nickel."

– **Andrew Osterloh**
Vice-President Projects & Operations
FPX Nickel Corp



INNOVATIONS FOR A SUSTAINABLE MINING INDUSTRY

A significant portion of Corem's research activities is aimed at reducing the environmental impact of mining operations, either through elimination at the source or improvements in the performance of mineral processing. Corem supports its members in achieving their greenhouse gas (GHG) emission reduction targets for 2030 and 2050, as well as their overall solid, liquid, and gaseous emissions.

MANAGING EMISSIONS IN ALL THEIR STATES

Solid residues

Corem has been working for several years to demonstrate the potential of sorting technologies to its members and the industry through its research program and contractual projects. A total of 14 projects aimed at developing and demonstrating the technology on some 20 different ores have been conducted in 2022. Corem has built up solid expertise in determining the sortability of ores, based on samples of a few hundred kilograms. In addition, the research program aims to integrate new technologies such as hyperspectral cameras into sorting and the combination of several technologies (such as optical cameras, X-ray transmission, and hyperspectral imaging) and artificial intelligence analysis to broaden the scope of sorting and increase its performance on different ores. The implementation of this technology will make it possible to preconcentrate the ore and thus reduce the mass of rock to be processed by the concentrator at the source. The quantity of solid tailings sent to the tailings site will be significantly reduced, in addition to reducing energy consumption for ore processing and, in doing so, reducing GHG emissions.

Liquid residues

Corem has been developing a cyanide regeneration technology for several years and aims to complete a semi-industrial demonstration in 2023 with its mobile pilot plant. This mobile plant built in 2020–2021 was operated for the first time in 2021. The project also advanced in 2022 with the improvement and upgrade of Corem's pilot plant. This technology will eventually regenerate nearly 85% of the cyanide used in gold recovery plants. Currently, cyanide compounds in the concentrator effluents are oxidized to cyanate and sent to the final effluent. These cyanates will decompose as nitrogen compounds in the environment. Instead, the regeneration process will return these cyanide compounds as free cyanide, replacing the purchase of fresh cyanide, and thus eliminating the nitrogen compounds at the source. Moreover, sulfur dioxide, the most common oxidant used for cyanide destruction, will also be eliminated or greatly reduced since the amount of cyanide compounds to be destroyed would be reduced.

Gaseous emissions

The steel industry is one of the largest emitters of GHGs in Canada. However, iron and steel producers have made a strong commitment to become carbon neutral by 2050. One of the avenues adopted to achieve this goal is to convert steelmaking from blast furnaces to direct reduction and, in the future, by replacing natural gas entirely with hydrogen. This transition will require Canadian iron ore pellet producers to increase the quality of their products by reducing the amount of silica in their concentrates. Corem supports the efforts of its clients and members by working on the development of concentrate beneficiation, including flotation, to achieve the desired concentrate quality. In addition, in its research program, Corem is developing a test to better predict the behaviour of iron ore pellets in the direct reduction process. This technology will be a tool for mining companies to optimize their products and qualify them for steelmakers. Furthermore, the methodology will allow in the future to promote the development of pellets adapted to hydrogen reduction.

CRITICAL AND STRATEGIC MINERALS POSITIONING

Contribution to projects on materials for battery manufacturing

For several years now, Corem has been carrying out various projects covering all stages of critical and strategic mineral beneficiation. In fact, thanks to its recognized expertise in the processing of critical and strategic minerals (CSM) and its infrastructure, including its hydrometallurgical platform, Corem worked with several clients and partners in 2022 on all stages of the processing chain, from sorting projects to the development of high-purity processes for the metals required to manufacture batteries. In 2022, Corem completed multiple projects involving the beneficiation of lithium, nickel, graphite, titanium, niobium, copper, and vanadium. In addition to the extraction of mineral substances, Corem has been involved in projects targeting the recycling of battery materials and has thus contributed to the development of the Canadian and Québec circular economy. Corem is thus contributing in the development of the Canadian and Québec economies oriented toward renewable energies.

Capitalizing on Québec knowledge on CSM

During 2022, Corem worked on the development of a strategic partnership to leverage knowledge and scientific efforts on critical and strategic minerals and optimize existing infrastructure. This initiative will support mining companies operating in the CSM sector and help position Québec as a key player in improving environmentally friendly mining and concentration processes.

Development of alternative techniques for the separation of critical metals

The Ministère des Ressources naturelles et des Forêts du Québec (MRNF) is funding a technology development program to promote the development of Québec's rare earth element (REE) and nickel deposits. This project, with funding of $1.5M over three years ending in December 2023, is being carried out in partnership with Commerce Ressources, Torngat Metals, SOQUEM, Magneto Investment, and the MRNF, which form an advisory committee. This project includes several research partners such as CanmetMINING, the National Research Council of Canada (NRC), and Université Laval. The main objective of this program is to improve the collaborators' current processes and to develop alternative techniques for the extraction, purification, and separation of critical metals.

Three themes are covered in this program: 1) a new flowsheet for the improvement of the rare earth extraction process has been proposed in order to simplify the current flowsheet by reducing the number of leaching steps and reducing the consumption of reagents; 2) the development of a flowsheet for the separation of REE through the application of different techniques in collaboration with Université Laval; 3) a process for the extraction of nickel from asbestos flotation tailings through a glycine leaching technique in collaboration with Draslovka.

EFFICIENCY OF MINING OPERATIONS

Corem's mission is to improve the competitiveness of its members' plants. Many projects are therefore carried out in partnership with these plants to improve their metallurgical performance.

Metallurgy 4.0

To keep up with the increasing pace of technology evolution in the mineral processing industry, Corem has acquired a set of digital solutions for research, development, and the support of mineral processing plants and characterization laboratories through its digitalization. In 2022, Corem began the establishment of an analytical and technology mineral processing laboratory with the aim of developing digital services and systems. These tools will reduce analytical time, improve project efficiency, and allow real-time data sharing with our members, partners, and clients.

Several projects are underway, such as the development of big data analysis applications to extract knowledge from the data of the automated mineralogical analysis of samples from a flotation process or the development of a tool that allows the processing of a large amount of information from cameras and sensors located around the flotation cell. It is thus possible to assist the management of the flotation process with the application of methods derived from artificial intelligence in computer vision and time series analysis. In 2022, the project aimed at detecting and predicting anomalies that occur in the froth flotation process through the use of deep-learning methodologies.

"Corem's team have been a true collaboration partner on this project. They have gone above and beyond in making key and timely modifications to the CAHM equipment and have been incredibly flexible as the test plans have evolved. It takes a team to deliver a game-changing technology, and we wouldn't have advanced so quickly if it weren't for Corem's dedication and commitment to this project."

– **Gillian Holcroft**
Innovation Manager - Processing
Canada Mining Innovation Council

"As the premier organization globally for processing research and technology development, the partnership with Corem provides CMIC the perfect opportunity to develop new processing technologies such as CAHM rapidly."

– **Carl Weatherell,**
Executive Director & CEO
Canada Mining Innovation Council

MORE VALUE FOR THE MINING INDUSTRY

Optimizing operating costs remains a major objective of all Corem's research programs, regardless of expertise.

Grinding is recognized as the most energy-intensive process in the mineral processing chain. Following an evaluation of new comminution technologies, CMIC initiated a project to develop a new type of mill, the Conjugate Anvil Hammer Mill (CAHM), with Corem's participation in conducting the trials. Installation of the prototype at Corem was completed in August 2022, and the equipment was commissioned and tested by a team of CMIC, Corem, and the other development partners personnel. To date, nearly 20 tests have been conducted to evaluate the grinding performance and especially the energy consumption of the CAHM, which aims to reduce energy consumption by 50% compared to HPGR (High Pressure Grinding Roll) technology, considered one of the most efficient today at commercial level. The test plan for the CAHM will be completed in 2023 and will likely continue thereafter in application to other ores.

In the area of gold ores, Corem is continuing its efforts to develop operating strategies aimed at reducing cyanide consumption in gold leaching circuits. This project is primarily aimed at highly reactive sulfide ores that require pre-oxidation treatment prior to gold leaching. Several methodologies for adjusting the pH or adding lead nitrate were studied in order to not only increase the recovery of precious metals by reducing passivation, but also to reduce the consumption of reagents by limiting the reactions between the sulfide by-products and the cyanide. Several methodologies have been deployed at our members' plants as a result of laboratory work conducted during 2022.

Bioreagents at the heart of innovation

Over the past few years, Corem has turned its attention to technologies focused on sustainable development. A number of projects involving the use of biobased reagents have been integrated into our research programs.

Corem has partnered with Queen's University and NRC to develop a methodology for the use of microorganisms for the oxidation of sulfides in heap leaching operations. This project targets ores whose gold is classified as "unrecoverable" because it contains gold encapsulated in a sulfide matrix that is generally very reactive. In such a case, the bio-oxidation of the sulfides prior to the heap leaching process allows the opening of the sulfide matrix to make the gold surfaces accessible for leaching. The use of specific bacteria multiplied by bacterial culture allows, in addition, to maintain relatively low operating costs. After conclusive laboratory results in 2022, work will continue in the coming months to evaluate the metallurgical performance of this process on a pilot scale.

Corem completed its project to develop new polypeptide-based flotation reagents in 2022. In this project, specific polypeptides were identified and used as collectors in a sulfide flotation process on ore samples from Corem members. Compared to the best commercial collectors available on the market, the results obtained with the identified polypeptides showed comparable performance in terms of recovery, but with a higher selectivity leading to better quality concentrates.

Corem is present

PARTICIPATION IN EVENTS

- SME Annual Conference & Expo 2022, February 27 to March 2, 2022, Salt Lake City, UT, USA
  - *Replacement of wet ball milling with high pressure grinding ahead of mineral separation.* Authors: C. Gagnon, A. Rosa, S. Makni, R. McIvor, B. Klein, A. Kumar, F. Wang, D. Gong, and C. Saud
- Capital Projects Symposium, March 27 to 29, 2022, Toronto, ON, Canada
- SME MN Conference, April 11 to 13, 2022, Virginia, MN, USA
- CIM Convention / CMP National, May 1 to 4, 2022, Vancouver, BC, Canada
  - *Particle Ore Sorting Using DE-XRT: Challenges, Amenability Testing and Pilot Scale Studies.* Authors: A. Plugatyr, and O. Gravel
  - *Replacement of Wet Ball Milling Ahead of Mineral Separation With High-Pressure Grinding.* Author: R. E. McIvor
  - *Un algorithme Bilmat modifié pour équilibrer et estimer la composition minérale des flux d'une usine de traitement des minerais : application au concentrateur de minerai de fer de Minerai de fer Québec.* Authors: L. Boisvert, C. Bazin, F. Lavoie, and J. Caron
- Physical Separation '22, May 9 to 11, 2022, Falmouth, UK (in virtual mode)
  - *Cross-validation of ore sorting technology evaluation at pilot scale with bench-scale amenability testing on a subsample of rocks.* Authors: P. H. J. Mercier, O. Gravel, D. Amariei (Corem, Canada), and A. Plugatyr (National Research Council, Canada)
- État du fer au Québec, May 18 to 19, 2022, Québec, QC, Canada
  - *Participation of Francis Fournier in a panel discussion*
- Le 5 à 7 annuel de CMP OMQ, May 19, 2022, Montréal, QC, Canada
- Construire ensemble la recherche sur les MCS pour une économie verte, May 24, 2022, Québec, QC, Canada
- Congrès annuel de l'Association minière du Québec, June 8 to 9, 2022, Mont-Tremblant, QC, Canada
- Colloque ÉcotoQ, June 9 to 10, 2022, Québec, QC, Canada
- PDAC, June 13 to 15, 2022, Toronto, ON, Canada
- Gold 2022, July 17 to 20, 2022, Québec, QC, Canada
- 15th International Conference on Gas–Liquid and Gas–Liquid–Solid Reactor Engineering (GLS-15), August 7 to 10, 2022, Ottawa, ON, Canada
  - *Caractérisation de la mouillabilité des minéraux par une cellule de flottation de surface à flux continu : applications gaz-liquide-solide dans le traitement des minerais.* Authors: F. Moosakazemi, J. Bouchard, O. Gravel, and F. Larachi
- 19th IFAC Symposium on Control, Optimization and Automation in Mining, Mineral and Metal Processing, August 15 to 17, 2022, Montréal, QC, Canada
  - *Paradigme de détection des anomalies et d'inférence des processus pour une meilleure aide à la décision dans les systèmes de flottation en mousse.* Authors: S. de Blois, and O. Gravel
  - *Un modèle phénoménologique pour la cinétique des particules dans la séparation magnétique humide à faible intensité de type tambour.* Authors: J. S. Guiral-Vega, J. Bouchard, É. Poulin, A. Ure, C. du Breuil, and L. Pérez-Barnuevo
- IMPC Asia Pacific 2022, August 21 to 23, 2022, Melbourne, Australia (in virtual mode)
- IBA 2022 Conference (Institute for Briquetting and Agglomeration), Denver, CO, USA
- CMP - Nord-Ouest Québécois, September 28 to 30, 2022, Rouyn-Noranda, QC, Canada
  - *Démonstration à l'échelle pilote d'un procédé de recyclage du cyanure.* Author: P. Laflamme
- Xplor 2022, October 3 to 6, 2022, Montréal, QC, Canada
  - *Organizers of the geometallurgy session: La géométallurgie : élément clé d'un projet minier réussi.* Presided by: S. Lévesque, and A. Ure
  - *L'importance de la minéralogie appliquée pour votre programme de géométallurgie.* Author: C. du Breuil
- Procemin – Geomet, October 5 to 7, 2022 (in virtual mode)
- CMP Southern Ontario, October 6, 2022, Toronto, ON, Canada
- CMP - Ottawa, Montréal, Québec, November 17, 2022, Montréal, QC, Canada
  - *Un algorithme Bilmat modifié pour équilibrer et estimer la composition minérale des flux d'une usine de traitement des minerais : application au concentrateur de minerai de fer de Minerai de fer Québec.* Authors: L. Boisvert, C. Bazin, F. Lavoie, and J. Caron
- Québec Mines et Énergie, November 21 to 24, 2022, Québec, QC, Canada
  - *Défis minéralogiques et métallurgiques des MCS.* Authors: C. du Breuil, P. Laflamme, D. Mrabet, H. Emani, A. Ure, and B. Levasseur
- CMP - BC/Yukon, November 30 to December 1, 2022, Vancouver, BC, Canada

EXHIBITIONS

- CIM Convention / CMP National, May 1 to 4, 2022, Vancouver, BC, Canada
- PDAC, June 13 to 15, 2022, Toronto, ON, Canada
- Xplor 2022, October 3 to 6, 2022, Montréal, QC, Canada
- Québec Mines et Énergie, November 21 to 24, 2022, Québec, QC, Canada

PUBLICATIONS

- Plugatyr A., and Gravel O., *Particle Ore Sorting Using DE-XRT: Challenges, Amenability Testing and Pilot Scale Studies, CMP* – CIM BC 22, May 1 to 4, 2022
- Moosakazemi F., Bouchard J., Gravel O., and Larachi L., *Characterization of Mineral Wettability by a Continuous-Flow Surface Flotation Cell: Gas-Liquid-Solid Applications in Mineral Processing,* 15th International Conference on Gas–Liquid and Gas–Liquid–Solid Reactor Engineering (GLS-15), August 7 to 10, 2022
- de Blois S., and Gravel O., *Anomaly Detection and Process Inference Paradigm for Improved Decision Support in Froth Flotation Systems,* 19th IFAC Symposium on Control, Optimization and Automation in Mining, Mineral and Metal Processing, August 15 to 17, 2022
- Guiral-Vega J. S., Bouchard J., Poulin E., Ure A., du Breuil C., and Pérez-Barnuevo L., *A Phenomenological Model for Particle Kinetics in Drum-Type Wet Low-Intensity Magnetic Separation,* 19th IFAC Symposium on Control, Optimization and Automation in Mining, Mineral and Metal Processing.

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