Industry Session: Heap Leach Facilities

November 21, 2024

8-9am PST

MIRA

Mining Insurance & Risk Association

COLLABORATE | EDUCATE | CONSULT

Agenda

- MIRA Board Update
- Recent Heap Leach Failures
- Technical Overview of HLFs
- Risk Engineering & Loss Control
- Underwriting Heap Leach Exposures
- Takeaways
- Q&A
- Closed-Door Mining Round Table
  (To follow over Teams)

Photo Source: www.knightpiesold.com

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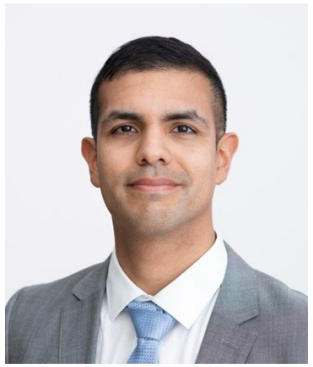
MIRA Update

- Working Groups Activity:
  - Technical Group
  - Wording Group
  - Education & Training Group
  - Closed-Door Session Mining Round Tables
- MIRA Website Refresh
- MIRA Global Conference Update

Speaker Introductions

Edwin Ruiz
Director, Tailings & Civil Infrastructure
Capstone Copper

Daniel Landers
Vice President, Risk Engineer, Mining
Swiss Re



Arturo Arellano
Underwriter Mining
Munich Re

Moderated by: Malerie Neid & Susan Zabolotniuk

Heap Leach Failures

Susan Zabolotniuk

Recent Heap Leach Failures

- Cöpler Mine in eastern Turkey
- Failure February 13, 2024
- Nine deaths
- Cause: 67-page report on causation
- 4 prosecutors assigned to investigate
- Six employees arrested
- Heap leach pad permanently closed
- Estimated cost of remediation $300M
- No estimate if/when operations will resume

Recent Heap Leach Failures

- Victoria Gold Eagle Gold Mine in Yukon
- 2023: VG fined over its HLF after 2021 spill of 17,000 litres of cyanide
- Failure June 24, 2024
- Company went into receivership 8/14/24
- PwC fired President & CEO
- PwC responsible for remediation
- No mining activities will occur until all remediation complete

Not-So-Recent Heap Leach Failure

- Bellavista Mine in Costa Rica
- May 2007: warned of landslide
- July 2007: initiated RM treatment
- October 21, 2007: landslide
- Immediate shutdown of the mine; ultimately permanent
- Mine life of 8 years; closed after 2 years
- 2009: third owner filed statement of claim
- Final settlement: 2017, during trial
- 2020: new owner looking to redevelop

Technical Overview of Heap Leach Facilities

Edwin Ruiz

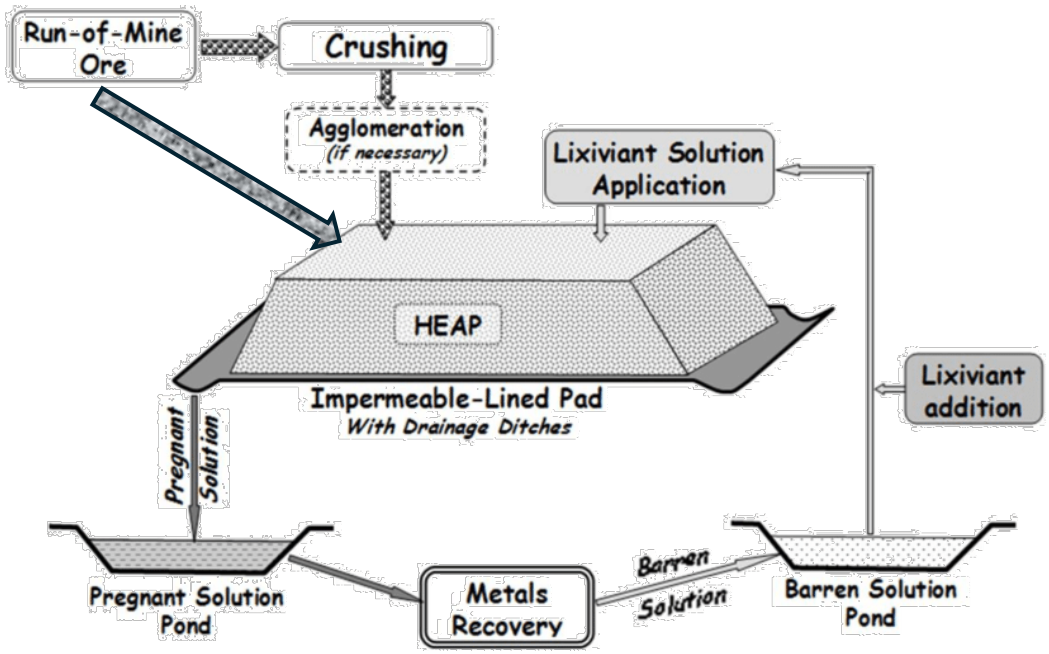
Heap Leach Facility Overview

Heap leaching (HL) is a hydrometallurgical process where solution is applied to dissolve minerals in ore, and the solution is processed to recover the minerals.

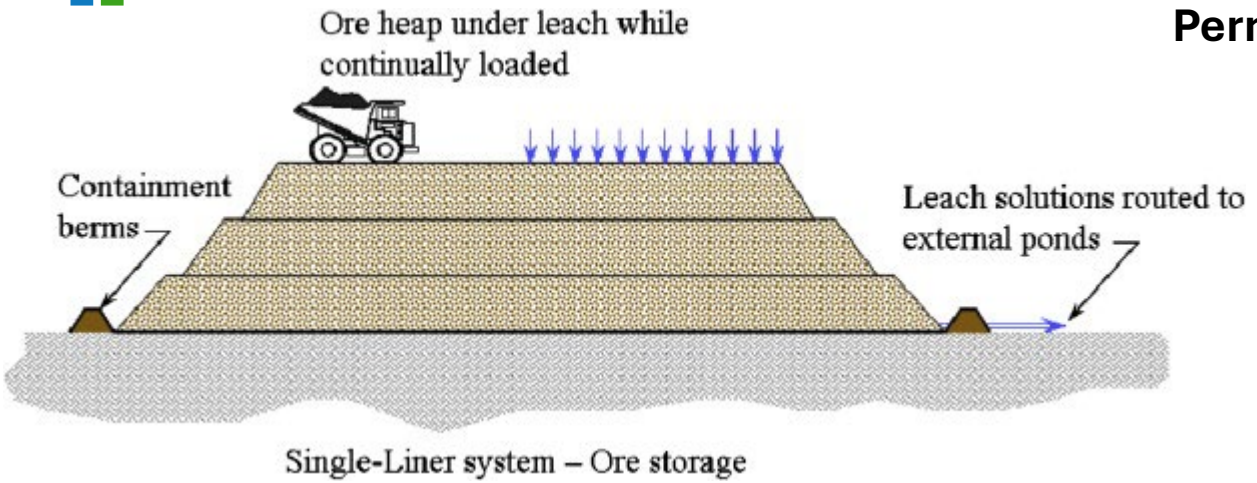
Due to its low capital and operating costs, heap leaching has long been an attractive option for the recovery of base and precious metals from low grade ores.
(Canadian Mining Journal)

Currently, Heap Leach technology is successfully used to extract gold, silver, copper, nickel, uranium, and even iodine.

How many HLF are there globally?

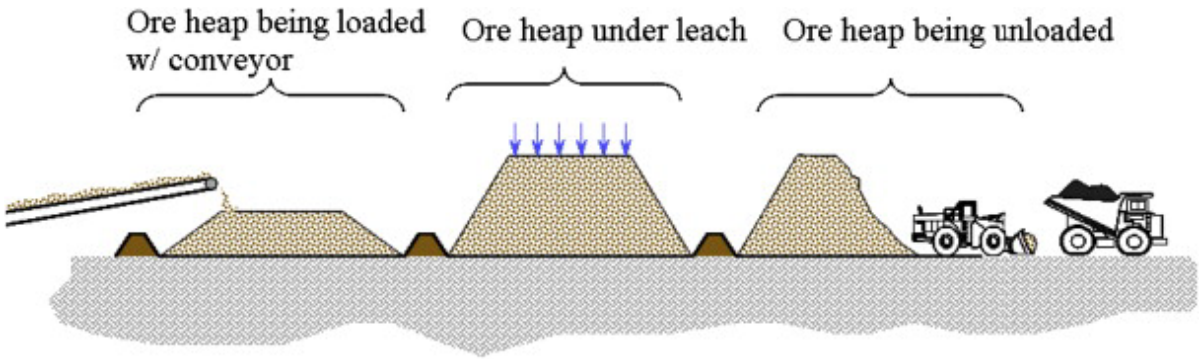


Heap Leach Facility Overview



Single-Liner system – Ore storage

Permanent HLF



Single liner system exposed load/unloading stress

Dynamic HLF

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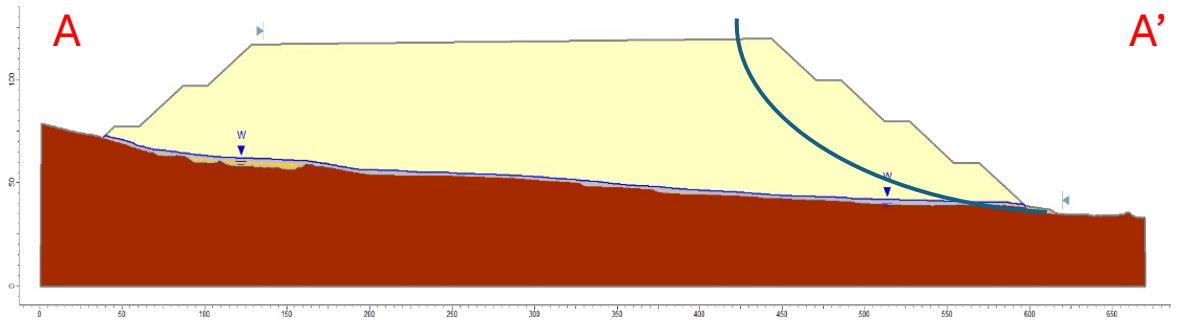
Typical Risks & Failure Modes of Facilities

- **Strategic Risk**
  - Legal & Regulatory
  - Reputational & Geopolitical
  - Growth potential
  - Social license to operate
  - Environmental
- **Operational Risk**
  - **Geotechnical Stability**
    (benches, slope, foundation, facility breach)
  - **Operational continuity**
  - **Geochemical stability**
    (leakage, water, acid rock drainage, seepage)
  - **Water Management**

- **Root Causes**
  - Governance
  - Design
  - QA/QC
  - Construction
  - Leaching Ratio
  - Site investigation
  - Earthquakes
  - Operational Procedures
  - Monitoring / Instrumentation



Governance & Management Systems

- Global technical standards
- Local regulations
- Internal Standards
- Plan – Do – Check – Act
- Facilities Life Cycle
- Inventory
- Roles & responsibilities (RFE, EOR, IGRB)
- Consequence classification
- Inspections, Critical Controls, TARPs
- Infrastructure risk - Failure modes
- Stakeholder & Community engagement

Waste Management System Pillars

Risk Engineering & Loss Control

Daniel Landers

Risk Engineering & Loss Control – Background

- Heap Leach Pads have always been included in the engineering review of any site
- **Current landscape on Heap Leach Facilities:**
  - HLFs are typically non-regulated facilities ("non-impounding", depending on jurisdiction) – usually not subject to same regulatory burden as dams or TSFs
  - Historically less focus on HLFs on risk engineering from property insurance side due to fewer market losses
  - Typically, less concern due to more limited runout potential of the material with associated off-site impacts
  - Facilities are usually designed by specialist firms who provide oversight during the operational window – where failure potential is higher due to irrigation
  - No common global standard, but engineering practice generally follows similar approaches
  - Insurance reviews cannot have the granularity to capture inherent flaws in the design or site conditions – reliance on sound engineering practice
- Companies with more advanced geotechnical risk management programs have included heap leach pads within their review framework for decades
  - Generally, more focused on facilities with crushed or crushed/agglomerated ore due to inherent properties of the stacked ore – noting Run-of-Mine pads may also be susceptible to failure depending on facility specifics

Risk Engineering & Loss Control – Exposure and Management

- **What we look at :**
  - Downstream exposure
  - Off-site release exposure
  - Complexity of facility
    - Foundation or siting complexity
    - Run-of mine ore or crushed/agglomerated ore
    - Ore degradation potential
    - Operational deviations from design
      - Fines content
      - Stacking history – any fines placed on resisting zones
  - Involvement of experienced firms/professionals in the design and stewardship
  - Risk management programs
    - Are facilities included in stewardship programs?
    - Are third-party reviews of design completed?
  - Facility inspection specifics – condition, monitoring, staffing

Risk Engineering & Loss Control – Outlook

- Likely no need for global guidelines
  - Standard of practice generally adequate
    - Implementation of robust design scope and monitoring programs best approach
- Trends:
  - More information may be requested in submission for locations where there is perceived high inherent risk/complex facilities or conditions, or exposure to downstream client property or third-party exposure
  - Questions on third-party review programs or scope
  - Additional focus on company-wide practices – risk assessment
- Proactive evaluation of portfolio risks and communication/disclosure in the best interest of policy holders to facilitate renewals

Underwriting Heap Leach Exposures

Arturo Arellano

Underwriting the exposure - Outlook

- Recent events driving market and risk management initiatives
- History of Tailings Storage Facilities (TSF) Clause
  - Context
  - Rationale for a clause
  - Transition from old to new approach
  - Evolution of the wording
- LMA initiative – Heap Leach Facilities (HLF) Clause
  - Rationale for a clause
  - Scope of cover
  - Sublimit and its application
  - Parallels with the TSF Clause
- Risk appetite
- Information requested as part of the submission

Key Takeaways

All Panel Speakers

Questions?

Please use the raise hand feature under "react" or type your question in the chat.

Follow up questions?

Feedback?

Topic Suggestions?

Wish to Volunteer?

....please email secretary@mininginsurancegroup.com

Newsletter sign up:

miraassoc.com/contact-us/ newsletter

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