



**engenium**  
smart project delivery

## Copper

Copper (Cu) is a soft, malleable and ductile metal with high thermal and electrical conductivity which is widely used in the commercial, industrial and agricultural industries. Copper occurs as either native copper or in minerals such as copper sulphides (chalcopyrite, bornite, covellite, chalcocite), copper carbonates (azurite, malachite), copper oxide (cuprite, tenorite) or copper silicates (chrysocolla).

### Our Expertise

The Engenium experience covers a diverse commodity base and throughput range. Engenium has the ability to evaluate its client's resource and utilise sound metallurgical and mineralogical principals to engineer flowsheets suited to a variety of commodities and incorporating the entire spectrum of metallurgical unit operations.

Within the copper industry the Engenium Process Engineers have gained their experience in key senior project development and technical roles for projects and operations which utilise conventional froth flotation, oxidative pressure leaching, bacterial leaching, ferric leaching, ammonia leaching or a combination of processing routes to recover copper from primary copper sulphides, secondary copper sulphides and oxidised copper ore bodies.

### Our Capabilities

The services provided by Engenium include:

- Metallurgical testwork design, supervision, interpretation and geo-metallurgical assessment of ore bodies containing primary sulphide, secondary

sulphide, carbonate and oxide copper minerals.

- Process selection studies based upon copper mineralogy incorporating various leaching routes (heap, vat, atmospheric tank and high temperature-pressure leaching) of whole ores and concentrates.
- Comminution studies and projects including single, two and three stage crushing, high pressure grinding rolls, single stage SAG milling, single stage Ball milling, SAB, SABC, AG milling, rod milling, fine and ultra-fine milling.
- Recovery via bulk and selective flotation, reverse flotation, flash flotation, column flotation, as well as various gravity processing routes.
- Greenfield and brownfield flotation circuit evaluation and modelling including application of new or novel technologies.
- Concentrate handling including thickening and filtration, materials handling and slurry system design.
- Recovery from leach solutions by EW, SX, IX, precipitation, cementation or crystallisation.
- Engineering – concept and feasibility study across all disciplines, owners team representation during project development.
- Management and Coordination – project management, study management, owner's representation, project implementation strategies, design management, project engineering, cost control, scheduling.
- Commissioning, operations ramp-up and optimisation.
- NI 43-101 support, reporting and QP sign-off.
- Capital Equipment – QA/QC, selection, inspection, storage, maintenance and expediting.

**Delivering Value. Delivering Results.**