

# CESL Copper Technology

29

**Cu**  
63.55  
copper



## CESL Copper Process Description

CESL technology has been adapted to treat copper or bulk concentrates such as copper-nickel and copper-gold to produce a copper cathode product.

The CESL Process is a medium temperature pressure oxidation of sulphide based concentrates in the presence of chloride catalytic ions. A light re-grind may be necessary depending on concentrate particle size. Grinding the concentrate increases the surface area of the particles which favourably affects the oxidation and recovery of the copper minerals in the autoclave.

Using high purity oxygen, the copper, nickel, zinc and cobalt minerals are oxidized in an autoclave at 150 °C and 200 psi. The oxidized minerals are leached into solution in the autoclave or from the pressure oxidation solids with raffinate at atmospheric conditions depending on the pyrite content in the concentrate.

Sulphur in the concentrate is primarily oxidized to elemental sulphur instead of sulphate. Excess sulphate is removed from the process through neutralization and gypsum production. The presence of chloride in the autoclave helps to increase the rate of reaction and reduce sulphur oxidation. The low sulphur oxidation in the CESL pressure oxidation process decreases operating and capital costs and thus allows for economic recovery of metals from such a low grade concentrate

Leaching occurs in the autoclave or from the pressure oxidation solids with raffinate at atmospheric conditions. Following pressure oxidation, the slurry from the autoclave is discharged into a pressure letdown system. A thickener followed by filtration separates the pregnant leach liquor from the leach residue.

Leach residue is washed to remove entrained copper by using a counter current decantation circuit or belt-filter. This residue can be sent to tailings or for precious metals recovery. Since gold and silver do not leach in the CESL Copper Process, the precious metals remain in the residue. The gold can be recovered by the CESL Gold Process.

The leach liquor is sent to the copper solvent extraction for selective copper recovery using a commercial organic extractant. The extractant is loaded with copper and then washed to remove entrained chloride and impurities. Nickel from the leach liquor can also be recovered by the CESL Nickel Process as an intermediate product or nickel metal.

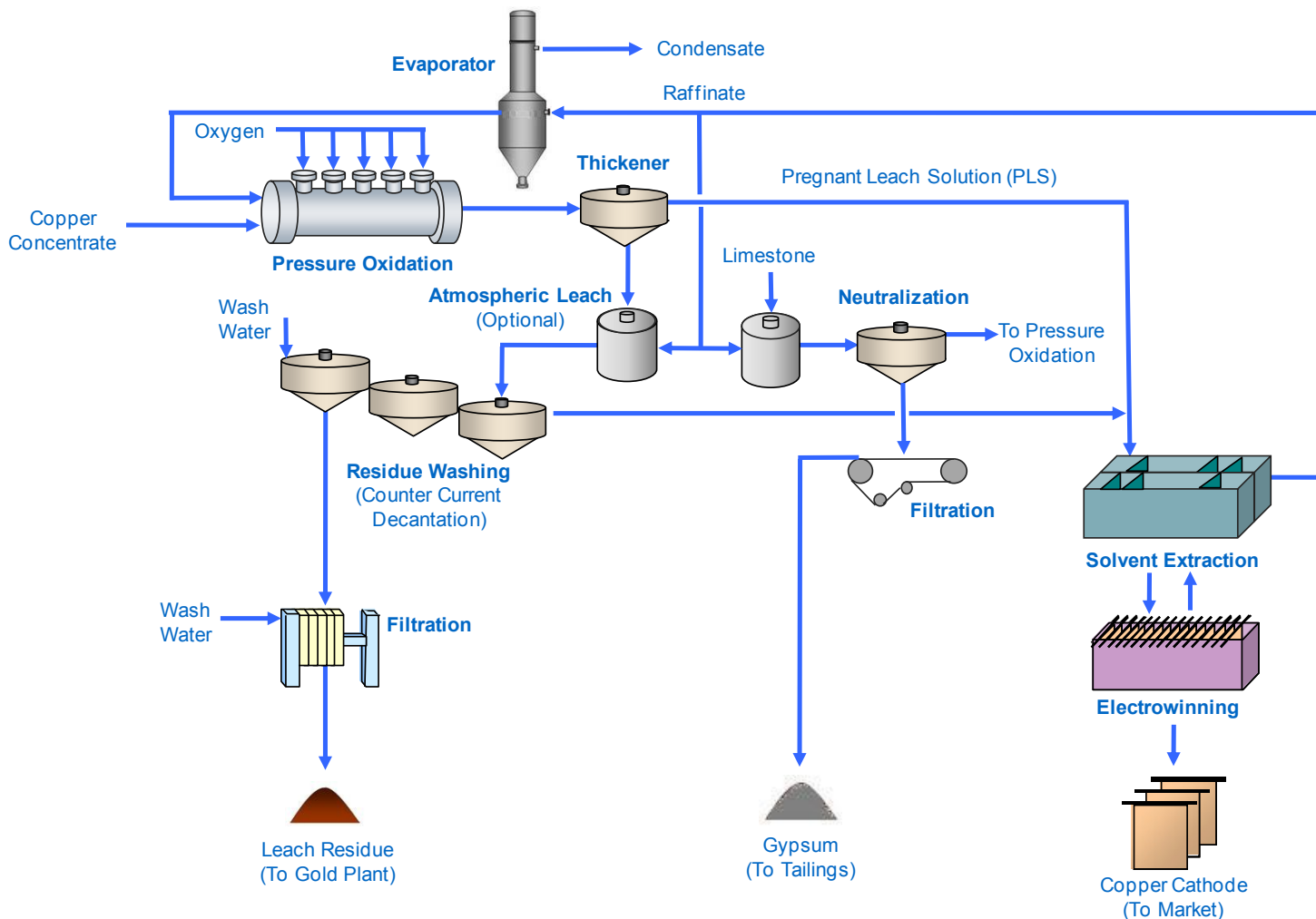
After washing the organic, the copper on the extractant is stripped into a pure copper electrolyte, providing the feed to copper electrowinning. LME grade-A copper cathodes are produced under conventional conditions.

Raffinate from solvent extraction is partial neutralized with limestone to remove any excess sulphate. This forms gypsum where it is sent to tailings.

An evaporator is used to maintain the plant water balance. Any water additions to the plant that are in excess of the flash steam from pressure oxidation, the evaporation from heated tanks or the entrained solution in the solids must be removed by the evaporator as condensate to ensure a stable plant inventory. These water additions include grinding water, reagent makeup water, and wash solutions.

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## CESL Copper Process Flowsheet



## CESL Copper Process Technology Advantages

CESL has developed an efficient process for recovering copper from a wide variety of base metal sulphide concentrates and can process bulk, lower grade, or impurity-challenged concentrates which may otherwise incur additional smelting costs. This effective technology can recover all payable metals simultaneously. Some key advantages include:

- With medium temperature pressure leach in the presence of chloride ions yields an increase to the rate of reaction and low sulphur oxidation. Low sulphur oxidation in Pressure Oxidation minimizes both capital and operating costs as in a reduced vessel size, oxygen consumption and acid neutralization costs.
- On-site processing can further reduce operating cost of a mine by sheltering it from downstream costs which include shipping concentrate, treatment and refining charges.
- The process is a proven technology which uses commercial processes such as pressure oxidation, solvent extraction and electrowinning to produce LME Grade-A copper cathodes with a purity of greater than 99%.
- The CESL Process minimizes environmental impact by producing no gaseous emissions and no significant liquid effluents. The solid by-products of the process including leach residue and gypsum are environmentally stable and can be managed effectively or co-stored with tailings.



**LME Grade-A copper cathodes**