

CESL Nickel Technology

Ni
58.69
nickel

28

Co
58.93
cobalt

27



CESL Hydrometallurgical Process

To address the continued growth in demand for base metals, Teck has developed hydrometallurgical processes collectively known as the CESL Technology. They have been developed at CESL's world class hydrometallurgical facility in Richmond, BC, Canada. Cost competitive and regarded as thoroughly tested, the technology is a viable solution for refining sulphide concentrates.



The technology is capable of handling future trends in mineral resource development, including: low grades in ore and concentrate, mineralogical complexity and deleterious elements, enhanced metal extraction and recovery, demand for greater efficiency, increased importance of sustainability and stronger environmental standards.



Why the CESL Process for Nickel?

CESL's hydrometallurgical technology can be applied to massive, disseminated and polymetallic nickel concentrates while recovering a high percentage of all payable metals including copper and cobalt products.

Disseminated nickel ores are widely distributed around the world and can be found in most of the known nickel sulphide districts. These sulphide-poor, magnesium rich deposits are often unsuitable for traditional smelting technology due to metallurgical constraints with respect to MgO content (i.e. Fe:MgO ratio). CESL technology, which is insensitive to MgO content in concentrate, allows a mine mill operation to focus on metal recovery from ore without constraints imposed to produce concentrate with a high Fe:MgO ratio.



The process can also treat polymetallic (bulk Ni-Cu-Co) concentrates with no need for metal separation at the milling stage.

The CESL Nickel Process is also well suited for onsite treatment of standard nickel concentrates that commercial smelters currently process. This option offers the miner low site realization costs, flexibility in handling concentrate grades and impurities with higher payable nickel and cobalt products.

CESL Nickel Process

In the CESL Nickel Process, sulphide concentrate is subjected to mild pressure oxidation temperature (150°C) and pressure (1380kPa) conditions where nickel, cobalt and copper are leached into solution. Copper can be recovered via standard SX/EW technology if present in economic quantities.

After solution purification, nickel and cobalt can be recovered as a mixed hydroxide product (MHP). The production of separate nickel and cobalt intermediate products is also possible using a novel solvent extraction process. In doing so, cobalt is recovered as a carbonate product while nickel is recovered as a pure nickel hydroxide product.

For projects with a high nickel nameplate capacity, nickel metal can be produced by leaching the high purity nickel hydroxide cake for electrolytic processing.

Process Advantages

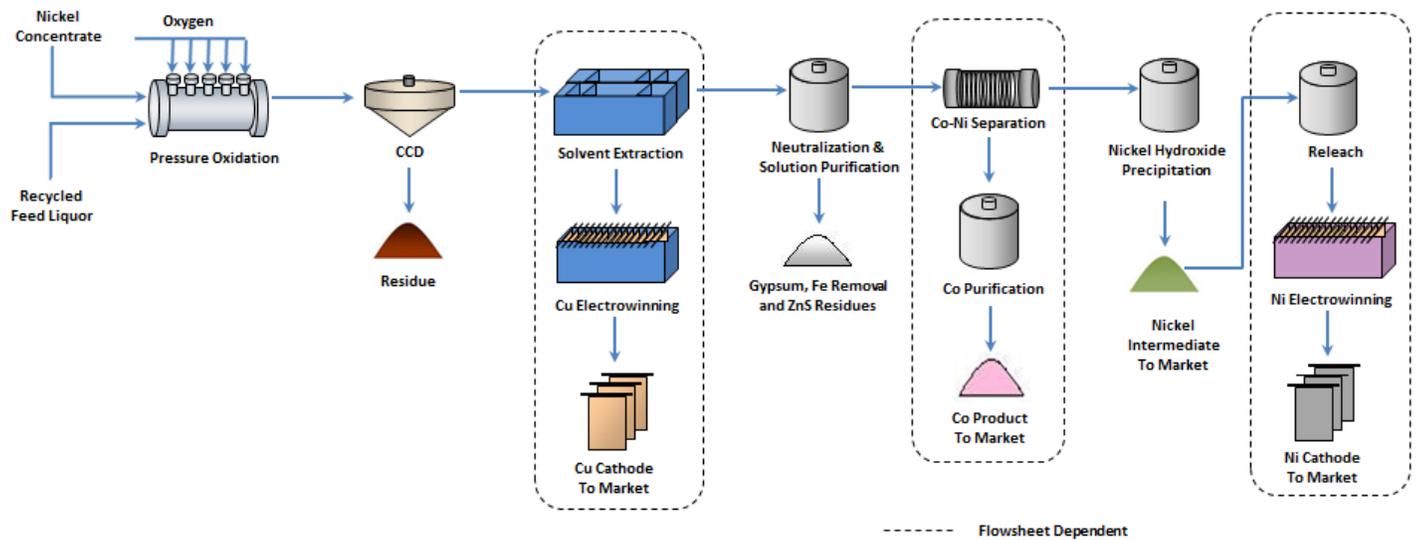
Some of the advantages of the CESL process for efficient recovery of nickel, cobalt and copper are:

- Well-developed flexible technology that allows for the treatment of all sulphide concentrates
- Medium temperature pressure leach conditions with low sulphur oxidation
- High metal recoveries for nickel, cobalt and copper
- Effective impurity control and purification
- Production of marketable, high grade intermediate products
- Production of nickel and copper metal
- Minimal energy requirements outside of Electrowinning
- Capable of operating with the use of seawater
- Sustainable process that minimizes environmental impact

CESL Limited

12380 Horseshoe Way
Richmond, BC
Canada, V7A 4Z1
+1 778 296 4900 Tel
+1 778 296 4908 Fax
info@cesl.com
www.cesl.com

CESL Nickel Process Flowsheet



CESL Nickel Process – Proven Results

The facilities at CESL offer three scales of testwork: bench, pilot or demonstration. CESL mitigates the technical risk of hydrometallurgical projects by applying a staged approach to process developments supported by industry standard geochemical, mineralogical and metallurgical capabilities.

In the development of the nickel technology, CESL has worked with industry clients using various business arrangements. Generally, a project is defined through bench testwork, followed by more detailed and integrated testwork including pilot operations once economic optimum conditions are identified.

CESL has been testing various nickel sulphide concentrates since 1994 from bench scale to continuous pilot operations consistently proving that our technology is well-developed and robust. This flexibility allows for the treatment of sulphides, disseminated sulphides and polymetallic concentrates.

The depth of testing on nickel sulphide concentrates under CESL Nickel Process conditions has consistently demonstrated:

- Industry competitive cost structure for nickel production
 - ⇒ Low reagent consumption due to low sulphur oxidation and magnesium dissolution
 - ⇒ Medium temperature operating conditions yield lower sustaining costs and higher availability
 - ⇒ Cost effective impurity control and purification
- Metal extractions in excess of 97% for nickel, cobalt and 95% for copper



CESL Bench Autoclave Testing



Teck's Hydrometallurgical Testing Facility

To learn more, please visit our website at www.cesl.com