Hydromet Technology

Hydrometallurgy, or "hydromet" for short, is a metal processing technology that uses a chemical process combining water, oxygen or other substances in a pressurized or other vessel to dissolve a metal from its ore, concentrate or an intermediate product (such as matte).

The nickel industry worldwide has traditionally smelted concentrates produced from nickel, copper and cobalt sulphide ores to make an intermediate sulphide product called matte. Hydrometallurgy has been used for refining the matte to produce high purity nickel, copper and cobalt for the market. Thus, traditional production of these metals has occurred in two steps: smelting and refining. The new hydrometallurgical process that Vale developed will process the nickel concentrate directly to metal products without first having to smelt the concentrate.

The concentrate will be processed in a pressurized vessel where it will react with oxygen and sulphuric acid to produce an impure solution of nickel, cobalt and copper. This solution will pass through a number of chemical purification steps ending with removal of impurities and separation of nickel, copper and cobalt. The copper and cobalt will be recovered as by-products. The nickel will be recovered by electrolysis as high quality electronickel product suitable for market. The waste solids from the process will be neutralized with lime and will be deposited in a specially designed disposal facility. All water leaving the plant, including precipitation run-off water, will be processed to remove contaminants.

Because the hydromet process used at Long Harbour eliminates the requirement for smelting concentrate, it has an economic advantage over the traditional two-step smelting and refining process. The process will also yield more of the valuable cobalt which is lost to a great extent in the smelting process.

This type of hydrometallurgical process is not entirely new. Many operations, some of them in Canada, have used hydrometallurgical processes for years for extraction of zinc and copper from sulphide concentrates. However, it was not until the 1990s that an acid-oxidative hydromet technology was developed to process nickel sulphide concentrates.