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MOVING BED ION EXCHANGE DESORPTION FOR BASE METALS PROCESSING

By

Volha Yahorava, Jim Wall, and Nikolai Zontov

Clean TeQ Water, Australia

Presenter and Corresponding Author

Volha Yahorava

ABSTRACT

Ion exchange technology is typically considered in base metals hydrometallurgical flowsheets for (a) primary recovery of the value metal from clarified solutions and difficult-to-filter slurries/pulps, and (b) purification of the crude metal streams.

Numerous process and equipment options exist in configuring the adsorption step of the ion exchange process, including fixed bed and moving bed approaches. However, in base metals processing the options for the desorption step are usually limited to fixed bed configuration, using single column, multi-column, or carousel systems. In some sense, these limited options have hindered the deployment of ion exchange systems into base metals hydrometallurgical flowsheets. The single fixed bed approach suffers from an unfavourable water balance, with significant stream recycling required to manage reagent consumption, and with significant dilution of the value metal in the eluate going forward to downstream processing (i.e. the concentration of the metal in the eluate is much lower than the concentration of the metal on the resin). The multi-column or carousel approach improves reagent utilisation and eluate tenor, but cannot be integrated easily with moving bed ion exchange processes (including all resin-in-pulp applications, and systems such as NIMCIX or CLEAN-IX® CLX). Given their fixed bed nature, the single column and multi-column carousel are poorly suited from an operational point of view for desorption processes that can form precipitates (e.g. gypsum) or suffer from solids carry over.

This paper presents opportunities in the base metals industry where moving bed desorption, and in particular the use of the U-shaped desorption column, offers operational and economic advantages over fixed-bed approaches.

Firstly, the basic principles of base metal desorption from ion exchange resins with iminodiacetic acid (IDA) and aminomethylphosphonic acid (AMP) functionalities are presented. Case studies demonstrate how moving bed ion exchange desorption using the U-shaped column can provide (a) simultaneous purification and value metal upgrade; (b) decreased cross-contamination between value metal and impurity bleed streams, and; (c) close-to-stoichiometric reagent consumption.

Incorporating moving bed desorption into base metals ion exchange flowsheets, in particular using the U-shaped column, has the potential to unlock significant project value. This value will come from reduced ion exchange reagent requirements, higher tenor eluate, reduced hydraulic load for downstream processing, and/or additional downstream processing options. In many cases, this increase in project value will be the deciding factor on a project's viability.

Keywords: ion exchange, base metals, counter-current desorption, moving bed U-shaped column