Jochen Petersen: IRON CONTROL ISSUES IN HEAP LEACHING

This presentation gives a brief overview of heap leaching as a technology for the recovery of values from low grade ores. Its primary application is in the area of copper leaching, both of oxide and sulphide minerals, and therefore the presentation will focus on these, although it is understood that similar issue apply to the heap leaching of other commodities.

In the heap leaching of copper oxide materials, iron species may be released from gangue minerals, but in the oxidative leaching of copper sulphides they originate from some of the target minerals directly (e.g. bornite, chalcopyrite) or from the ubiquitous pyrite associated with most metal sulphides. In oxidative leaching the presence of iron is to an extent desirable as it acts as the redox carrier between oxygen and the sulphides (with or without the mediation of micro-organisms), but concentrations of 1-2 g/L are perfectly sufficient to this end.

Regardless of source, released iron accumulates in the recycled leach solution due to the high selectivity of the usually applied LIX® reagents towards the target copper. Some form of iron 'control' occurs through natural pH buffering within the heap, resulting in the re-precipitation of various iron oxy-hydroxides and jarosites. However, at the generally low operating temperatures of heaps the formation of mostly amorphous precipitate can lead to a gradual decline of heap permeability, which is particularly detrimental to sulphide heap leaching which operates over much longer time-spans than oxide heap leaching. Furthermore, iron-oxy hydroxides are well-known metal adsorbents that can give rise to scavenging of the copper value in the leach liquor and retard their release into the PLS. The practice of building fresh heaps on top of spent heaps is intended to reduce footprint and recover additional value. However, due to the dual effect of heap clogging and adsorption scavenging by precipitated iron species, any gains from this practice are likely to marginal or even negative.

True iron control is not practiced in copper heap leaching, but should be given serious consideration to facilitate more rapid leaching, providing the increased productivity more than offsets the cost of the relevant iron control technology.