Optimisation of the Performance of Cathode Risk Pots

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Abstract

The initial response in a smelter which suffers from multiple damaged cathode pots was to increase metal levels to cool cathodes and reduce the chance of pot failure. However this strategy led to reduced performance as cooler cathodes led to dissolution problems, higher sludge formation, increase in cathode voltage drop (CVD), and high heat dissipation from the sidewall requiring higher voltage to maintain heat balance. An optimisation plan was carried out on six test pots over a year which included improved anode change/cavity cleaning practices and more accurate liquid level measurements. In addition to improved work practices, a revised process control strategy was tested, including a new cryolite ratio (CR) control regime and use of data from multiple pot parameters to perform weekly analyses of heat balance on individual test pots. This weekly analysis led to decisions aimed at maintaining heat balance and improved pot performance. During the program, metal level on test pots was reduced gradually in order to reduce heat dissipation from the sidewall, improve alumina solubility and prevent the increase of CVD; this measure, in conjunction with voltage optimisation, CR control and new operational practices, offered an improved performance in terms of energy consumption, stability and high current efficiency (CE).

Keywords: Aluminium electrolysis cells; heat balance analysis; CR control; liquid levels measurement.