Using SPC Method to Design an Aluminum Fluoride Addition Strategy for Aluminium Electrolysis

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Abstract

A 400 kA aluminum reduction potline suffers from extensive cathode damage due to defects in the refractories materials. The aluminum level was raised in order to reduce a further damage of the pots. However, it caused increased heat dissipation from the sidewall, which increased the energy consumption and formed long ledge toe that caused frequent cathode problems such as cracking. An optimization plan was carried out on six test pots over a year which included, among other measures, a new cryolite ratio (CR) and bath temperature control regime. These were necessary as reduction of CR and bath temperatures variations were a precondition for pot performance optimization. A new AlF_3 feeding strategy which is based on Statistical Process Control (SPC) method, was implemented on the test pots and compared to a group of reference pots. This strategy aimed to reduce the variations of AlF_3 feed leading to a reduction of variations in cryolite ratio (CR), and the bath temperature. After 4 months of operation, the variation of AlF_3 additions was reduced by 35 % and thereby reducing variation in CR by 37 % and bath temperature variations by 14 % compared to a group of reference pots. This control method ensured a more stable operation which allows optimization of metal level and voltage.

Keywords: Bath chemistry control; SPC method; aluminium fluoride feeding strategy.