

Contact Resistance versus Pressure of Electrical Connections Used in Aluminium Smelter Potlines

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Abstract

The contact resistance of electrical connections used in aluminium smelter potlines are a source of wasted energy consumption. This excess energy consumption depends on initial contact surface cleanliness, contact pressure, contact area, and long term corrosion. The variability of contact resistance between the anode rod and anode beam (known as ‘clamp drop’), and between the collector bar and flex connectors can cause uneven current distribution across the reduction cell which negatively impacts process performance. This research studies the correlation of contact resistance to contact pressure with different surface cleanliness and with nickel plating. The materials studied include aluminium and steel connections which are predominantly used in modern smelter anode and bus connections. The nickel plating is studied as a surface treatment to lower contact resistance of normally fast oxidizing surfaces such as aluminium, and to reduce long term corrosion between the contacting surfaces.

Keywords: Electrical contact resistance; energy consumption; clamp voltage drop; anode rod; anode beam.