

Design Options to Reduce Specific Energy Consumption in Aluminium Electrolysis Cells

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Abstract

The aluminium smelting industry is facing a period of economic challenge, where the aluminium price is down due to a supply-demand imbalance. The industry is now seeking ways to reduce costs in order to remain competitive. One of the few options that the aluminium smelters have is to reduce energy consumption, since it represents around 35 % of the production cost. Design options to reduce energy consumption by two ways are presented. One way is reducing the heat generated by Joule effect in the cathode and anode conductors, including an innovative design feature to reduce voltage drop in the anode. Another way is reducing the heat losses through the anode and cathode panel. These concepts can be used in existing technologies. Numerical models were used to predict the behaviour of these options and their impact on the cell thermal balance. Approximately 0.8 kWh/kg Al saving is predicted after implementation of all options presented in this paper.

Keywords: Aluminium electrolysis cells; energy consumption; anode design; cathode lining; thermal balance.