Modeling of Aluminum Tapping Operational Management to Enhance Smelter Productivity

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Abstract

A good planning and control of the operations involved in a smelter is crucial for achieving a high-level of performance and productivity for the plant. Given the large number of processes involved in a smelter, as well as their complexity and interrelationships, it is far from trivial to evaluate the actual operational impacts of changes to the cell amperage, work organization and schedules, equipment capacities and replacement, the layout, etc. In the present work, a simulation model based on the discrete event method is developed to analyze the operations management related to the tapping of aluminum from the electrolysis cells. The inputs to the model are the plant layout, the work schedule, the travel and process times, the availability and the capacity of the equipment such as crucibles, cranes, etc., and the list of required cells to be tapped, based on the cast house requirements. The model was validated with plant data. Results of the simulation include the details of all operations performed within a 24 hour period and the time at which they were completed. The simulation also provides information such as the idle times of equipment and workers, and the operational incapacity to respect the planning, if applicable. The simulation model proposed can therefore be viewed as a powerful tool to test different scenarios and guide towards profitable short-term and long-term planning decisions.

Keywords: Planning and control of operations; aluminum electrolysis cell tapping; discrete event simulation; amperage creep.