Development and Introduction of Slotted Anodes Technology at Talum Smelter

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Abstract

Talum is the only primary aluminium producer in Slovenia since 1954, when production in Soderberg potline with capacity of 20 000 t/year was started. In 1987, Talum's aluminium production was modernized with reconstruction of existing Soderberg potline to prebaked technology and start-up of the new prebake AP18 potline of 80 cells. Since then, Talum has established one of the most efficient productions of primary aluminium worldwide in energy consumption, carbon consumption and pot life [1]. Anodes used in the AP18 technology are among the biggest anodes (1530 mm x 1010 mm) used for aluminium production. Since the beginning Talum was facing two phenomena in the AP18 process: Significant number of horizontal cracks caused by thermal shock and relatively high electrical resistance and instability caused by gas bubbles below the big surface of anodes. Talum's response to these specific problems was slotted anode development. Talum started with industrial trials in 2001 when the potline was extended to 160 cells. At the end of 2003, slotted anodes were integrated in the process. In 2013, Talum developed technology to erect the third top-downward slot with additional positive effects on potline performance. The paper provides Talum's slotted anodes technology development in production of green anodes, deployment of slotted anodes into the electrolytic process and overall results.

Keywords: Talum; innovation; AP 18 technology; slotted anode; top-downward anode slot.

1. Introduction

Many companies all around the world introduced slotted anodes at the end of 1990s and early 2000s [2 – 4]. Talum as well put a lot of effort to develop and optimize the technology for slotted anode production. With some industrial tests the advantages of slotted anodes to minimize anode gas bubble voltage drop was proved and reduction of energy consumption was achieved. The question was not "to do or not to do?", but "how to do?"

At that time two possible ways to prepare slotted anodes were studied: Creation of slots during vibro forming of green anodes before baking or slot cutting with special machine after baking process. Both solution have positive and negative impacts on the quality, scrap ratio and overall costs of production. Finally the decision was to adapt vibro compactor with additional plates at the bottom of model and to build special machine for cleaning the slots of coke after baking.

After ten years from industrial implementation of the bottom slots on the 160 cells AP18 potline, Talum explored and researched additional benefits from the third top-downward slot,

which allowed extending the positive effect of slotted anodes until the end of anode life time. Final design of slotted anodes is shown in Figure 1.

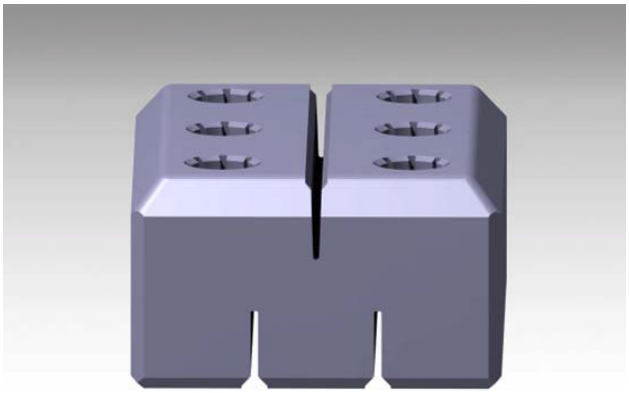
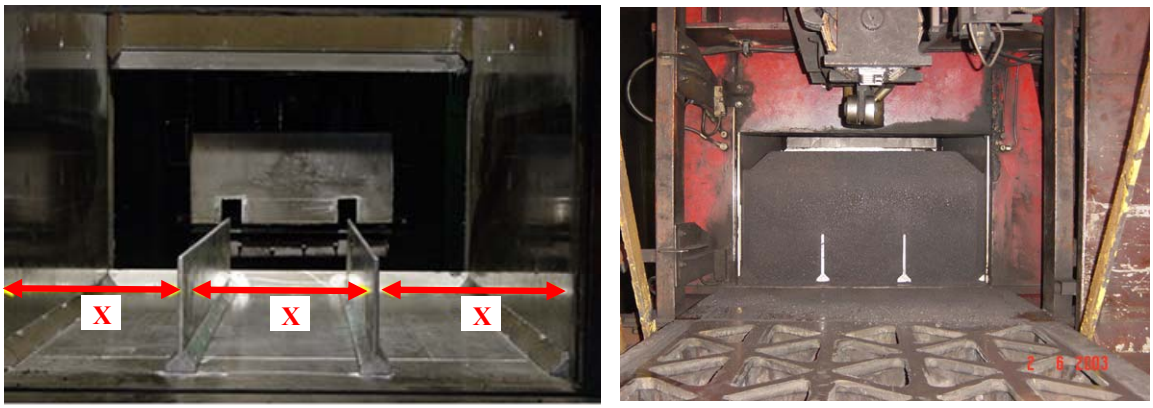


Figure 1. New Talum AP 18 anode design.

2. Introduction of Two Bottom Slots

2.1. Adaptation of vibro compacting process

In June 2003 vibro compactor was rebuild with two conic steel plates (230/220 mm) at the bottom of model. With plates, the anode was divided into three equal surfaces. A modification of a pusher was made according to the new geometry.



a. New design of the model and pusher b. Green anode inside the model.

Figure 2. New design of the vibro compacting unit.

For anode baking tests, some anodes had the slots blocked with wood in order to prevent entering the packing coke ans some anodes were left with open slots. After anode baking, a comparison of slot deformation and sticking of packing coke on the walls between the anodes between the two groups was made. The slots filled with packing coke showed much better results (less deformations and sticking), Figure 3.

6. References

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