



Automatic anode slotting machine by T. T. Tomorrow Technology

Slotted anodes can save a smelter between 0.11 and 0.17 kWh/kg of produced aluminium. Thus it is easy to compute the smelter's considerable energy and cost benefit from the anode slotting technology. If the energy saved is used to produce additional metal units, production can increase from 1.1 to 1.7 percent, resulting in additional income.



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Equipment test at T.T.'s premises

Energy savings and the increase in production are the obvious economic benefits resulting from the use of slotted anodes in the potrooms. In addition, there are operational benefits related to the slots in the bottom of the anode, namely:

- Reduced ACD distance (lower ohmic voltage drop of 50-100 mV)
- Increased pot stability
- Improved current efficiency
- Better alumina dissolution.

The slots reduce thermal stress in the anodes, so reducing the risks of cracks; and they help the gas bubbles to escape from under the anode, which improves the pot stability and reduces the cell voltage drop.

The depth of the slots and their geometry are key parameters for optimising the performance of the slotted anodes in the smelters. Where green anodes are slotted, the slots are formed directly in the mould box. This constraint limits the width, depth, position, direction and geometry of the slots.

The Italian engineering and manufacturing company T.T. Tomorrow Technology has confirmed its leading position in the design and supply of Automatic Anode Slotting Machines for baked anodes. They thus avoid the main geometrical limits which apply to the production of slots in the green anodes. These slots cut in the anodes after baking have the following three major advantages. Firstly, increased slot depth ensures that the benefits last for the entire anode life (full life slot). Secondly, reduced slot width, which increases the active surface of the slotted anodes and the overall anode density in the pot. Thirdly, extreme flexibility in the choice of slot shape. This is important in order to achieve further benefits in the pot management through control of the gas exit direction and related effects.

that the benefits of the slots last for the full anode life. This allows greater economic and production benefits in the potroom management than can be achieved with shorter or pre-formed slots.

- The depth and the inclination of the slots can be reviewed and modified even in the slotting line: the slot configuration is therefore flexible, as well as the slot shape
- Another big and important advantage of the automatic anode slotting machine is that it can cut interrupted slots (which can control the gas flow toward the centre of the pots).

The proprietary software continuously checks and optimises the cutting parameters to prolong the life of blades and cutters.

Following positive experience in previous jobs, this project also includes a pre-operational phase to install a by-pass line. This is to allow loading/unloading the anode warehouse during installation of the new automatic anode slotting machine, which interrupts the existing line. Thus rodding shop and potrooms operation will be unaffected by the interruption in the anodes handling system during erection of the new equipment.

Installation and start-up of this new slotting line will be short anyway since it needs no civil engineering works. It is important to mention that the standard realisation of such an automatic slot cutting machine usually requires significant civil works. When the work environment is a brownfield smelter,

The latest contract awarded to T.T. Tomorrow Technology was from one of the most important and advanced smelters in the northeast of Europe. It concerns the supply of one new automatic anode slotting line with following main characteristics:

- The anode slotting machine in automatic mode can cut slots up to 450 mm deep, thus ensuring

civil engineering work may result in higher expenditure and a longer shutdown of portions of the existing lines. During civil and installation works the smelter must then allow for reduced production capacity using the part remaining in operation. This requires careful planning, organisation and coordination.

When the project is not for a greenfield smelter a design option has been developed to avoid major civil works and related costs. This design avoids underground pits and trenches for material transfer, aspiration, maintenance access, etc.: conveyors, pipes and other equipment are above the floor level.

According to the T.T. Tomorrow Technology standard delivery procedure, the automatic slot cutting machine is fully assembled and fully tested for its operation (using anodes supplied by the client) before it leaves the company's premises in Italy. Fine tuning, performance test and acceptance by the customer are thus completed before delivery to site.

This is a key strategy to limit the installation, commissioning and start-up time needed at the destination. It reduces related costs, ensures smooth and fast commissioning, allows trouble-free transfer to production, and minimises interruptions of ongoing operations.

In order to install and have in operation a new anode slotting machine, Tomorrow Technology usually needs only three to four weeks of work at the customer's site. T.T. therefore proposes its design and experience in order to considerably reduce the costs related to civil works as well as to reduce the total downtime of the line during the installation of the new anode slot cutting system.

A downstream material recovery system in combination with air filtration allow to reach almost 100 percent recovery and recycling rate of the carbon collected after slots have been cut. ■



Slotting machine tested in Italy before delivery