Thirty Years of Continuous Technical Progress at Aluminij Mostar Smelter

Davor Ramljak[1], Boris Vican[2], Darko Ostojić[3], Robert Zovko[4], Zoran Raspudić[5] and Josip Kožul[6]

1. Chief Technologist of Electrolysis for Regulation and Process Management,
2. Executive Director of Technical Affairs and Development
3. Director of Electrolysis Plant and OP
4. Director of Anode Plant
5. Director of Cast House
6. Technologist in the Production of Anodes

Aluminij d.d. Mostar, Bosnia and Herzegovina
Corresponding author: davor.ramljak@aluminij.ba

Abstract

The Aluminij d.d. smelter, located at Mostar, Bosnia and Herzegovina, started in 1981 with the 140 kA AP14 Pechiney cell design. The 256 side-worked cells were installed in two potrooms of only one potline. The cells were converted to center point-feeder cells in a hot-change operation during only nine months from September 2001 to May 2002. Each cell was equipped with three point feeders, two crust breakers, an ELAS process controller and network to a central control room for observation and adjustment of cell parameters [1]. Parallel to that, a new automatic alumina pot feeding system was installed to transport more than 220 000 tonnes of enriched alumina per year from four silos to the 256 pots. New crucible cleaning machine and new cell shell-straightening machine was bought. Total primary aluminium production was increased by 35 % with same number of pots because of amperage and current efficiency increase. New vibro-compactor and longer anodes were introduced, together with new anode baking furnace and a new additional rectifier in power substation. The challenging situation for smelters located in Southeastern Europe requires further optimizations in electricity consumption and other cost reduction.

Keywords: Aluminij Mostar, technical progress, smelter performance, smelter retrofit and modernization.

1. Anode Plant

At the beginning of 2001, the introduction of new technology in the factory, including changes to the pot header configuration in order to compensate for the negative effects of magnetic induction, changes in the cathode cores, changes in certain parts of the cathode part of the circuit and especially important changes in the construction of the superstructure of the cell, was agreed with the German company VAW, all in order to introduce a system of automatic point feeding alumina in the cell with a power boost up to 165 kA. For the same number of pots, now it was possible to increase the annual aluminum production to about 118 000 tons. However, in order to make full use of this new technology, many operations have to be carried out in all other parts of the factory. In the Anode Plant, the following was done:

- Modification of the coke and pitch handling plants,
- Installation of new dosimeter line,
- Installation of new firing system and anode baking control systems,
- Modification of both cranes in the anode baking plant,
- Extension of the furnace with 4 new chambers,
- Changes in anode scrap and rodding plants,
- New plant for coal treatment,
- Modernization of bath treatment plant,

In the anode rodding plant at the alumina and bath treatment line new grinder B09, metal

selector as well as alumina silos B30, "Glama" machine, anode shot peening machine, anode grinder C 2.1.1. at the anode scrap line, press for removing casting from anode rod plugs, casting cleaning device (rotating drum), stubs control and straightening device, electro-induction stub dryer, rod brush cleaner, and system ‘’Arts’’ - anode scrap and shroud weight management system were installed.

The realization of this project was approaching the end in the year 2002 and other ideas for further improvement of the factory were already "on the way". Increasing the size of the anode may allow increasing the pot amperage. The solution for further production increase was found in the project for the construction of a new electrolysis plant, where the first phase of the project duplicates the capacity of the anode plant and at the same time makes further changes in the construction of the pot cathode in order to further increase the current in the existing electrolysis. This first phase has its own value and economic justification, even if it does not lead to the construction of a new electrolysis because quality anodes have their market in the world. Therefore, a feasibility study on the construction of electrolysis had been contracted by 2002 and was completed and officially presented in December 2003.

At the beginning of 2006, a contract was signed with Outotec from Germany for the first phase of the new electrolysis, which includes the expansion of the anode plant and further increase of the electrical power in the electrolysis for a capacity of 130 000 t Al per year. As early as September 2006, a vacuum vibro-compactor was tested. During 8 weeks, time needed for an old hydraulic press to be disassembled and a new one installed, anode furnace was filled with green anodes from the warehouse, which was previously expanded according to the plan. The new vibro-compactor increases the quality of green anode produced and enables the capacity of baked anodes to increase to 120 000 t per year. A few years ago, the maximum production of baked anodes in the old furnace was forced with the aim of creating as many anodes as needed for supplying the electrolysis for three months, at which time it was planned to tear down the old anode baking furnace and to build a new modernized furnace, for larger anodes and for higher production capacity [2].

In the period from March to 15 April 2008, the following was done:

- Dismantling the old machines and parts of plant,
- Installation of new equipment in the “green’’ part of the plant,
- Installation of the new cooling tunnel for green anodes,
- Installation of new cranes in the warehouse, adapted to dimensions and weight of the new anodes,
- Controlled pulling down of old baking furnace and building of new one,
- Installation of the new gas injectors, and completely new fire management system,
- Installation of the new baking anodes gas purification system with the new 30 meters high chimney,
- Outotec Densitrol (on-line green apparent density control at vibro-compactors) management program at the anode tower.

The new anode furnace was started on 15 May 2008. At the ceremony regarding the end of the works at the anode factory, the smelter management concluded the following:

"*Aluminum industry in the world is constantly evolving, and if Aluminij Mostar wants to keep up with the world companies, it must constantly invest in modernization and new technologies."*

After the 2016 plan on raising production to 100 % capacity, some capital investments were needed from the beginning of 2017. the following were realized: purchase, installation and commissioning of new control cabinets for ‘’F dozers’’ for dry material dosing on an anode tower, modification of the "Glama", the machine in the anode rodding plant, and also a

Slabs, also used to be sawed off, at the plant produced by *Wagner*. The blade was rounded (blade diameter 1800 mm, thickness 15 mm) and the speed at which it was sawed was max 1500 mm/min. Later, in year 2007, *Sermas* slabs sawing plant and marking unit was purchased.
Sawing and marking manages a fully automated control line, consisting of three independent parts that are interconnected:

- Inbound trolley (inbound table and wagon),
- Sawing line,
- Outbound trolley (outbound wagon, micro-tick marking and labeling systems, storage ramp),
- *Sermas* uses a horizontal band for sawing of thickness 1.1 mm and maximum cutting speed is 2300 mm/min. For each cut, the weight of sawed peace is calculated by the PLC, and the label is printed. The label will contain information on the number of castings, alloy and weight.

5. Summary

For the last thirty years the smelter Aluminij d.d. Mostar is well known in this part of Europe. During that time it produced 3 million tonnes of aluminium and this year it celebrates twenty years since its startup after the war in Bosnia and Herzegovina. During this time a lot of knowledge, financial resources and efforts have been invested in it to be more productive, more efficient, safer and more environmentally friendly.

6. References

1. Volker von der Ohe, Conversion of the AP14 potline at ALUMINIJ d.d. Mostar from side to point feeding, *LightMetals* 2003, 387-391.
2. Miroslav Jakovljević, *Moja priča o aluminiju* (*My Story of Aluminium), 2011,* http://miroslavjakovljevic.iz.hr/wp-content/uploads/2011/12/Moja-prica.pdf. (in Croatian).
3. Ch. Droste, I. Eick and M. Segatz, Process Modelling as a Key Factor in AP14 Retrofit at ALUMINIJ d.d. Mostar, *LightMetals* 2003, 367-371.
4. C. Duwe, K. von Geldern, The Moeller direct pot feeding system for a smooth and constant pneumatic transport of secondary alumina, to the electrolyte cells, *Proceedings of the 6th International Alumina Quality Workshop,* 2002*,* 228-232.