Equipment Improvements on Existing Anode Paste Plants

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Abstract

Due to the worldwide overcapacity in the primary aluminum sector, a long period of time dominated by greenfield and brownfield projects has come to an end. Nowadays, the focus has changed to retrofits and small improvements on existing anode paste plants. In the late seventies of the last century, the combination of a screw pre-heater with a continuous kneader plus a downstream intensive remixer-cooler became the state of the art for anode paste preparation. The energy input for remixing and cooling did not have precise specifications, however, the delta T during cooling could be high if hydraulic presses were still in use. In the course of time, numerous single kneader lines have been expanded by adding an intensive remixer-cooler. Nowadays, other issues, especially the green and baked density decrease because of lower raw material quality, are of high importance. Equipment improvements in terms of higher specific mixing energy input and longer retention time combined with better wear protection will be necessary. In addition, the early models of Eirich Intensive Coolers are reaching the end of their life span and need an adequate replacement.

The paper describes the most interesting improvement steps from the beginnings until today.

Keywords: Carbon; mixing; paste; anode; retrofit.

1. Introduction

There are various reasons for revamping a green anode plant:

- Key equipment being worn out, seriously damaged or inefficient
- Introduction of a second mixing level for optimized process conditions [1]
- Increase of specific mixing energy with regard to green and baked density
- Higher quality and throughput requirements in connection with an amperage creep in the electrolysis
- Higher standards for health, environment and safety (HES)

Apart from a few D-type machines installed in the seventies and eighties of the last century, the breakthrough of the EIRICH Intensive Remixer-Cooler came with the RV23Conti model in 1989. After more than 20 years of permanent operation, the equipment is worn out nowadays and technically no longer up-to-date.

The main advantages of an equivalent new machine are:

- Heavier machine structure
- Better access for maintenance purposes
- Stronger power train (rotor motor and gear unit)
- Thus higher specific mixing energy available
- Mixer scale with 4 load cells
- Higher max. operational temperature

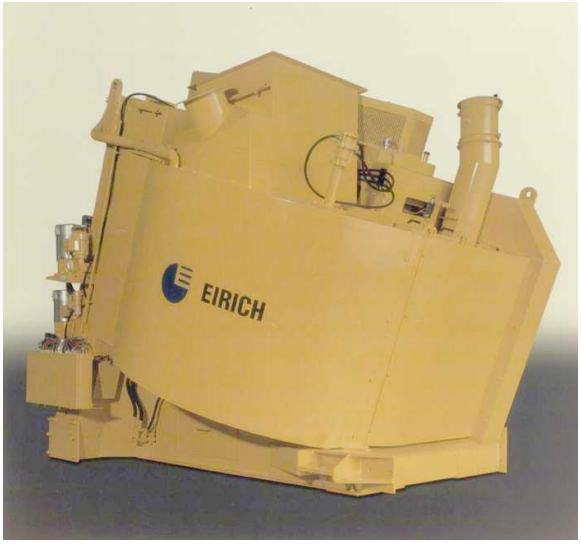

Figure 1. EIRICH remixer-cooler RV23Conti.

Figure 2. EIRICH remixer-cooler RV24Conti.

Table 1. Comparison of the main features of the cooler

	RV23Conti	**RV24Conti**
Manufacturing period	1989 - 2001	2001 - ….
Installed rotor drive	160 kW	200 kW
Typical rotor power	130 kW	160 kW
Specific mixing energy at 35 t/h	3.7 kWh/t	4.6 kWh/t
Max. operating temperature	180 °C	200 (250) °C
Mixing container volume	2 700 liter	2 700 liter
Paste load max.	2 300 kg	2 500 kg
Retention time at 35 t/h	3.9 minutes	4.3 minutes
Mixer scale	2 load cells	4 load cells
Inspection doors	2	3
Machine weight	11 800 kg	12 900 kg

2. Anode Plants with Key Equipment Being Worn Out

2.1. Smelter in Australia
Replacement of the RV23Conti intensive remixer-cooler by the RV24Conti

One of the two prototype machines for intensive anode paste cooling was supplied to a greenfield smelter in Australia early in 1990. The machine was to be integrated in a brand-new paste plant with very limited space. As a result, the design of the transfer chutes proved to be difficult and led to operational problems. Once a year, a general overhaul was performed by lifting the whole machine through the roof and forwarding it to the workshop by means of a crane.
Nevertheless, the machine has done its job in a sufficient manner over a long period. In the end, high maintenance costs plus the limited installed power of the machine led to the decision to replace the RV23Conti by a new RV24Conti which became operational at the end of 2008.
Thanks to the today's 3D design software, the integration of the new machine into the existing steel structure could be realized without any difficulties. All problems related to the transfer chutes, e.g. lump formation, disappeared when using the new design. The mixer scale now shows the real paste load in the machine.

6. References

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