Online Support for Amperage Creeping and Technology Brick Implementation

Bertrand Allano[1], Bernard Molinier[2] and Gwenola Jaouen[3]
1. Modeling and process control manager at LRF, Rio Tinto Aluminium, Saint Jean de Maurienne, France
2. Reduction senior consultant at LRF, Rio Tinto Aluminium, Saint Jean de Maurienne, France
3. RADAR™ account and product manager at Aluval, Rio Tinto Aluminium, Voreppe, France
Corresponding author: bertrand.allano@riotinto.com

Abstract

Over the last few years, successive cost cutting plans have reduced the in-house technical resources available to smelters. Meanwhile, ambitious projects such as progressively reducing the anode-cathode distance (ACD) so as to lower specific energy consumption have tended to reduce the robustness of the electrolysis process. To meet this kind of challenge and to guarantee a smooth and reliable improvement in performance, Rio Tinto Aluminium has developed a whole suite of benchmark tools some of which provide technical support from a location distant from the smelter concerned. This article will present the different phases of a project for progressively improving performance and describe some of those benchmark tools, including operating window, low ACD operation assessment and development plan, transition plan for moving from the present situation to the new one, go-no go process and RADAR™ remote support.

Keywords: Aluminum electrolysis cells, cell performance, progressive improvement, remote support.

1. Introduction

Most aluminum smelters are looking for ways to progressively improve the electrolysis process so as to increase their profitability. Moreover, considering the evolution of energy cost, such improvements must not increase specific energy consumption (SEC) but even reduce it to maximize the benefits. Rio Tinto Aluminium (RTA) has a solid track record in this field. For example, AP18 cells developed in the 1980's to operate at 180 kA are now running at more than 250 kA, as illustrated in Figure 1. To make this kind of change possible, technology solutions have been developed and are now available over the whole range of AP Technology™ cells either to increase productivity or to reduce specific energy consumption or a mix of both depending on the business case for the plant in question. To convert those technology solutions into value creation, a very rigorous process has to be followed using dedicated tools, some of which are presented in this paper. This process is even more essential to successful progressive improvement considering the cutbacks in technical staff over the last few years.

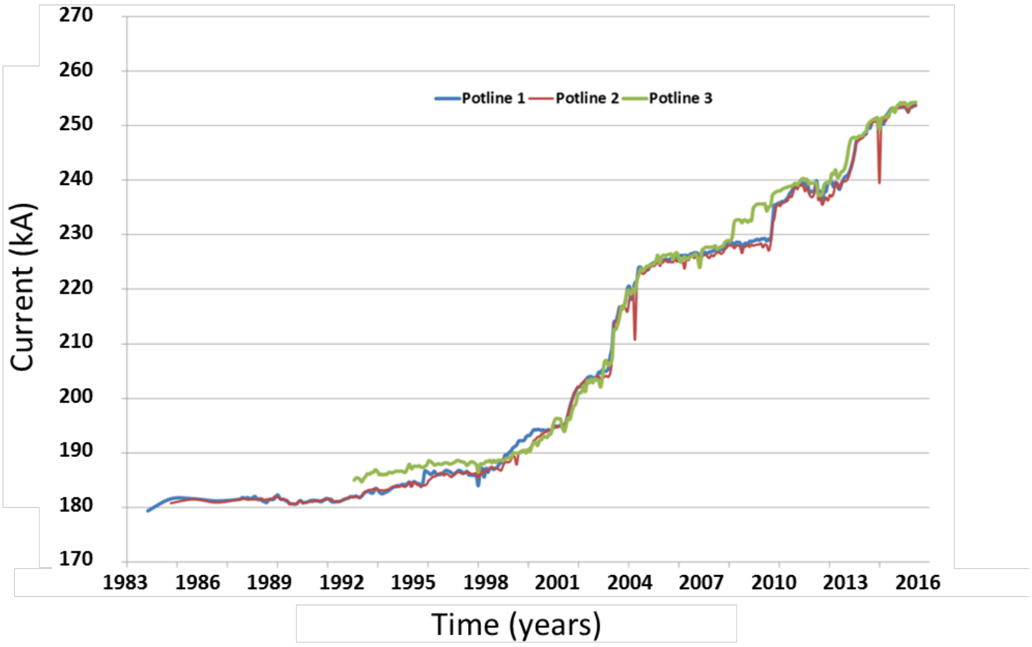

Figure 1. AP2X current increase in one RTA plant.

2. Cell Development Cycle

The cell development cycle is used to ensure that the proposed design will be optimal considering the technical and economic constraints of the plant. As Figure 2 shows, the cell development cycle consists of seven different stages; these will be described in detail in the following sections. Sometimes the prototype building and measurement stages can be skipped, as will be explained below.

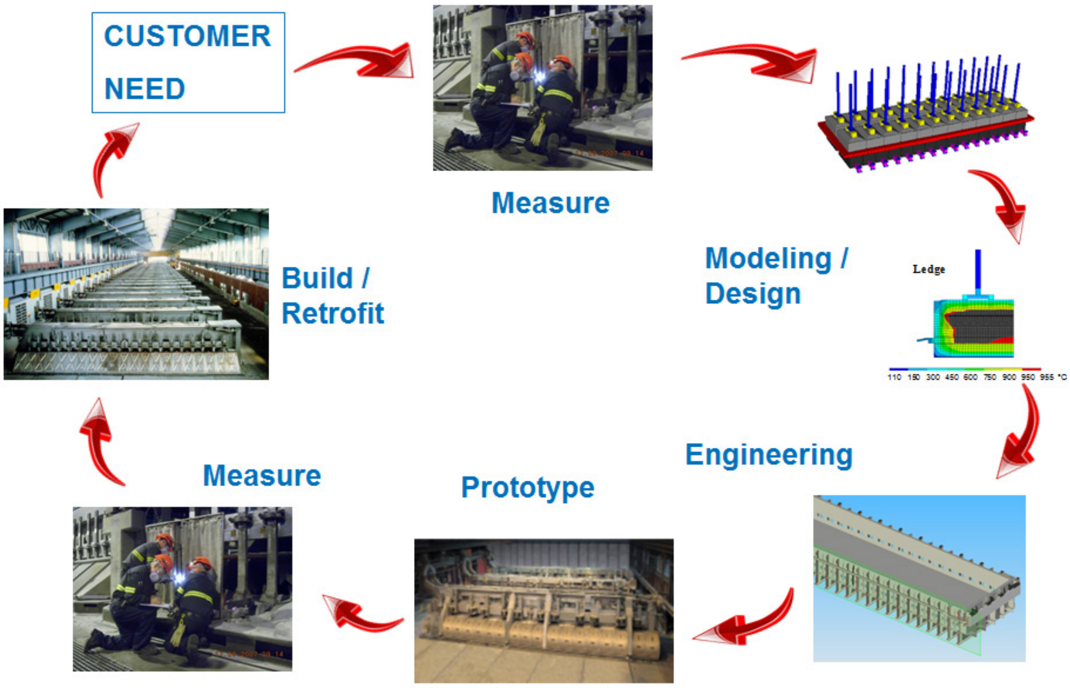

Figure 2. Cell development cycle.

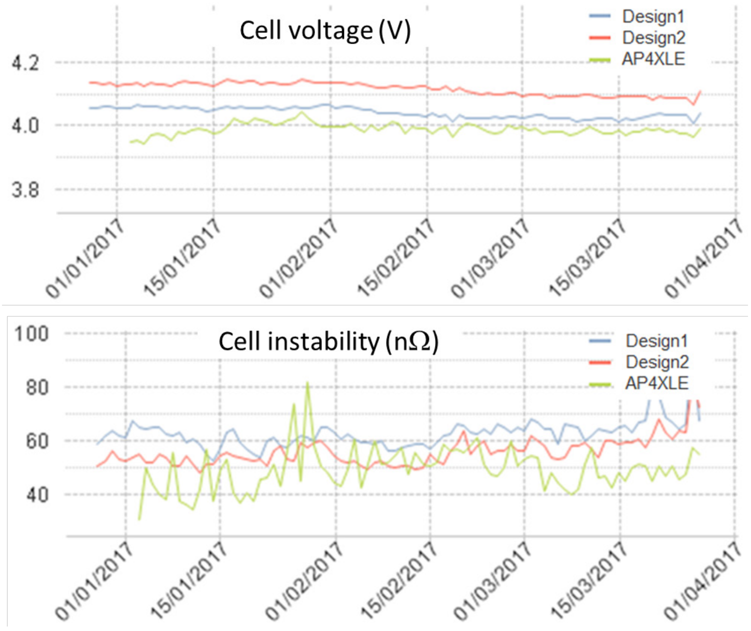

Figure 17. Performance of the new AP4XLE design under remote technical support.

5. Conclusion

Rio Tinto Aluminium has a solid track record of progressive improvement in smelter performance. This has led to the development of numerous tools, which ensure both optimal cell design and optimal transition. Optimal design is obtained by selecting the appropriate technology bricks in the AP Technology ™ portfolio in accordance with plant technical and economic constraints. The optimal transition is obtained by close technical support from the inception of the project through to smooth regular operation. Part of this support can be supplied remotely thanks to new technology including RADAR™ supervision.

6. References

1. Yves Caratini et al., Modeling and measurement to support technological development of AP60 and APXe cells, *Proceedings of 33rd International ICSOBA Conference*, *Travaux No.* 44, Dubai, UAE, 29 November – 1 December 2015, Paper AL03, 523-532.
2. Steve Langlois et al., 3D coupled magneto hydrodynamic and thermoelectric modeling applied to AP technology™ pots, *Light Metals* 2015, 771-775.
3. Benoit Bardet et al., Alumina dissolution modeling in aluminum electrolysis cell considering MHD driven convection and thermal impact, *Light Metals* 2016, 315-319.
4. Pascal Thibeault, Hervé Mézin, Olivier Martin, Rio Tinto AP44 cell technology development at Alma smelter, *Light Metals* 2016, 295-300.