A Bypass Bridge Design for the Installation of Additional Cells in an Operating Potline

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Abstract

To add extra cells in an operating potline represents a considerable engineering challenge, for it involves, apart from the installation of the new pots themselves, modifications to the existing conductors as well as tying the new cells to the gas treatment centre. The complexity of such a task is further increased if the selected location for the installation of the new pots lies in the middle of a potroom, involving replacement of an existing set of passageway linkage busbars. Given that existing operational cells cannot be stopped for the duration of the construction work, the usage of a bypass bridge is required. This article describes the joint efforts of an integrated EGA-HATCH-SNC team to increase the metal production of DUBAL Potline 8 by installing two additional reduction cells in the short passageway of each of the two potrooms while operating at full potline current. This was achieved using a dedicated bypass bridge, sized to carry 400 kA and connected to existing pot-to-pot circuits strictly by means of bolted busbar connections. Finally, the commissioning and performance of said bypass bridge is discussed.

Keywords: Aluminium electrolysis cells; brownfield potline expansion; bypass busbar bridge; bolted aluminium busbar connections; installation and performance of bypass busbar bridge.

1. Introduction

Dubai Aluminium ("DUBAL", also known as "Jebel Ali Operations") (Figure 1), an operating subsidiary of Emirates Global Aluminium ("EGA') in Jebel Ali, Dubai, currently has 1 577 cells and a total production of more than one million tonnes of aluminium per year.

Figure 1. Aerial view of the DUBAL smelter in Jebel Ali, Dubai.

DUBAL has been involved in technology development for more than 25 years. Its Technology Development & Transfer Department ("TD&T') has in-house capabilities in cell modeling, design and engineering which over the years have birthed different families of pots including the former P69 Kaiser cells converted to D18 and D18+; CD20, D20; and, more recently, DX, DX+ and DX+ Ultra. The focus of technology development at EGA has constantly been on improving productivity, reducing energy consumption and improving environmental performance, while reducing capital cost.

Following the successful implementation and more than seven years of operation of EGA's proprietary DX Technology in the DUBAL smelter, EGA management decided to increase the smelter throughput by installing additional reduction cells at minimum cost. DUBAL Potline 8 was selected for the following reasons:

- Its passageways were originally designed in such a way that two extra cells could be added per potroom, for a total of four additional extra pots.
- All required building and infrastructure facilities were already in place to house the new cells.
- It presented the opportunity to implement and test new design features in DX cells, which could be later adopted by EMAL, whose Potlines 1 and 2 operate 756 of those pots.
- Potline 8's proximity to TD&D makes it easy to conduct in-situ validation measurements and other commissioning-related tasks.

2. Options for Existing Potline's Extension

To add extra cells in an operating potline represents a considerable engineering challenge, for it involves, apart from the installation of the new pots themselves, modifications to the existing conductors, as well as tying the new pots to the gas treatment centre. One potential strategy, most often used to accomplish such a task, is to increase the length of the pot rows by adding new cells at the end of the potrooms near the existing crossover (as shown in Figure 2). This requires moving the existing crossover (yellow) further away (green) to make room for the new pots (green).

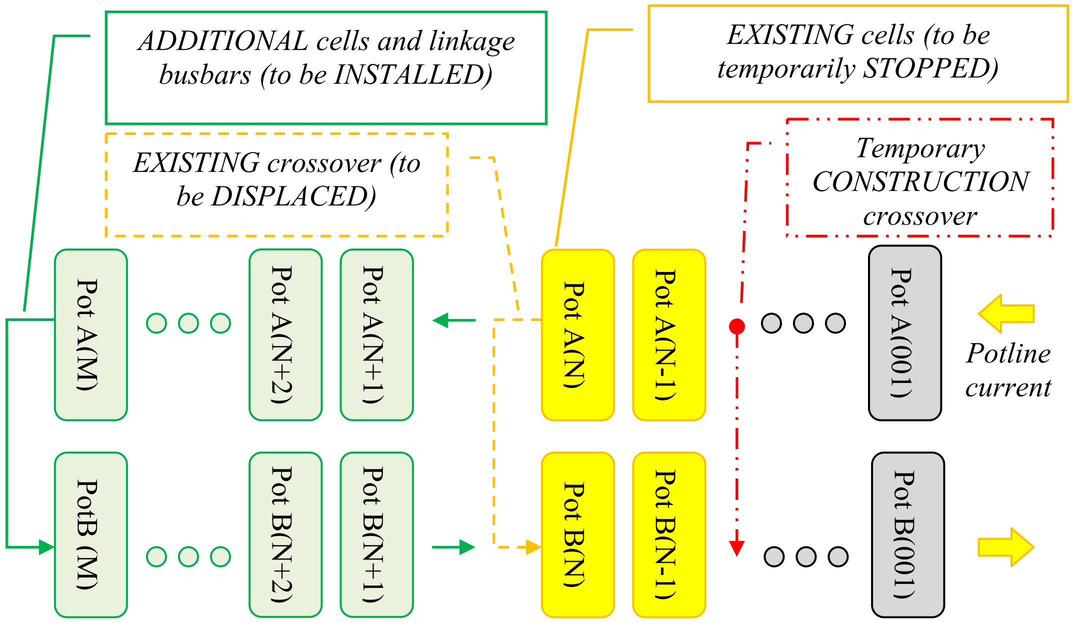

Figure 2. Increase of installed capacity by means of adding new cells at the end of the potrooms.

DUBAL Potline 8 operated at full current (402 kA) throughout the construction, without resorting to shutdowns. This was achieved by the inclusion of typical shunting-clamping stations to the bypass bridge design (see Figure 6), which reduced production losses and ensured the safety of the workers. The installation and coordination work of the bypass bridge was successfully executed without any incident, in spite of operational challenges of having live cells in operation nearby.

6. Conclusions

The construction of four new cells in DUBAL Potline 8 was carried out while the line operated at full potline current. The temporary construction bridge allowed all construction work to proceed smoothly without interference to the potline operations. It also allowed welding of the new busbars without potline shutdowns. MET was used to provide a safe working environment and there were no safety incidents from the start to the end of the project. The bypass bridge was dismantled when the busbars of the pots in a section were in place to enable short-circuiting with regular wedges until the start-up of the stopped pots.

7. Reference

1. *Aluminum Electrical Conductor Handbook*, Third edition, The Aluminum Association, 1989, page 13-41.