

## Amperage increase in DX potlines at EMAL

Vijayakumar Pillai<sup>1</sup>, Shaikha Al Shehhi<sup>2</sup>, Dinesh Bakshi<sup>3</sup>, Joseph Ndjebayi<sup>4</sup>, Tariq Majeed<sup>5</sup>

<sup>1</sup>Lead Engineer, Process Control Reduction

<sup>2</sup>Senior Manager, Process Control Reduction

<sup>3</sup>Lead Engineer, Process Information Reduction

<sup>4</sup>Manager, Potrooms Reduction

<sup>5</sup>Senior Superintendent, Potlines Reduction

Emirates Global Aluminium (EGA) Al Taweelah (EMAL)

Corresponding author: [vkumarpillai@ega.ae](mailto:vkumarpillai@ega.ae)

### Abstract



Emirates Aluminium (EMAL) completed the greenfield start-up of Potlines 1 and 2 in January 2011, comprising 756 pots using DX Technology developed by Dubai Aluminium (DUBAL). The start-up was at 350 kA and increased to 354 kA gradually over the first year. From January 2012, amperage creep started at the rate of 0.60 kA per week in both potlines simultaneously and reached 366 kA by June 2012. After about two months of process optimisation, the second phase of accelerated ramp-up at the rate of 2.0 kA per week to 380 kA commenced in August and was completed at the end of September 2012. The third phase was delayed until September 2014 due to Potline 3 start-up and reached 388 kA by February 2015 following an amperage increase rate of 0.35 kA per week. Different control strategies were applied during the three phases of amperage increase in order to minimise the thermal disturbances in pots and optimise performance. This paper discusses the steps taken for smooth and safe amperage increase with minimum process disturbances. Performance results achieved during the process are discussed and compared with the pilot section of 40 DX pots operating at DUBAL.

**Keywords:** DX Technology; amperage creep; side shell temperature; bath voltage.

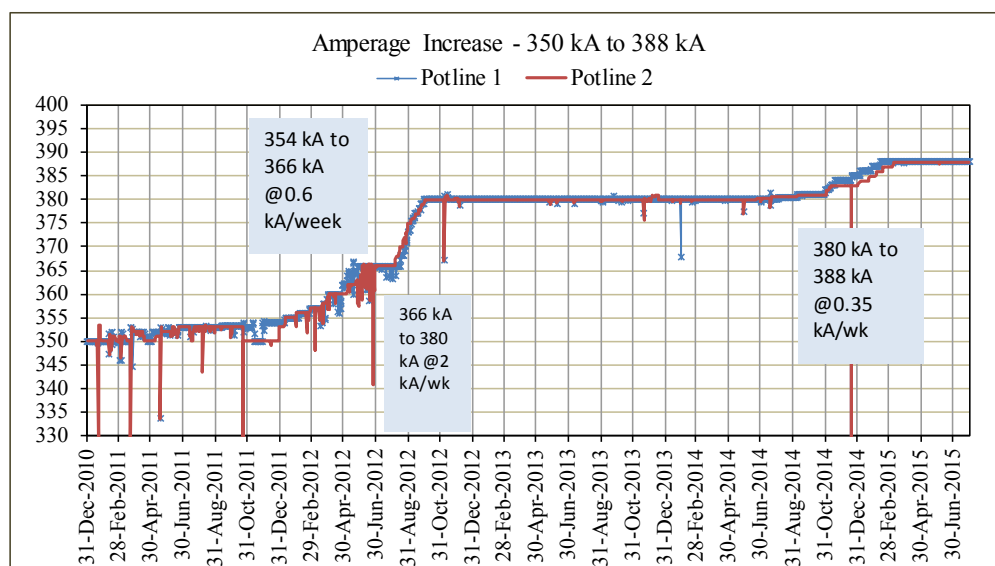
### 1. Introduction

EMAL Potlines 1 and 2 were started at 350 kA during 2009 and 2010 using DX Technology [1, 2]. The rectifier groups for each potline comprised five transformer-rectifiers, enabling an N-1 operating capacity at 350 kA. Within three months after completing the start-up, the amperage was increased to 352 kA. After confirming stable operation, the amperage was increased to 353 kA within the next three months and to 354 kA by the end of 2012. An upgrade project was on track to be completed by mid-2012, which would add a sixth rectifier to each potline and thereby increase the rectifier capacity to more than 400 kA. In January 2012, it was decided to increase the amperage slowly and steadily, even though N-1 condition would cause load reduction. By July 2012, both potlines reached 366 kA.

The sixth rectifier was commissioned in Potline 2 first and the accelerated amperage increase from 366 kA to 380 kA commenced from 7 August 2012. In the following week, the sixth rectifier was also ready in Potline 1 and the accelerated amperage increase commenced from 16 August 2012. Potline 2 reached the target amperage of 380 kA on 1 October 2012 and Potline 1 reached 380 kA on 8 October 2012. A performance test at 380 kA, carried out on a group of 30 adjacent reduction cells over a period of 28 days in February 2013, showed that DX Technology's performance at 380 kA exceeded expectations and showed potential for further amperage increase [3].

By June 2014, DUBAL, the technology supplier to EMAL, had developed the design for the next generation DX Technology pot, capable of operating at 400 kA and beyond [4]. The DX

generation two (G2) design involved a modified potshell and lining design. By mid-2014, the planned pot relining schedule based on a conservative cell age target of 1 900 days started in EMAL potlines. Accordingly, potshells that were turned around were modified to G2 design and installed with G2 lining design. As G2 design pots were designed for higher amperage, further increase in amperage was carried out, reaching 388 kA in March 2015. Figure 1 shows the different stages of amperage increase from 350 kA to 388 kA.



**Figure 1. Amperage increase in Potlines 1 and 2 from 350 kA to 388 kA**

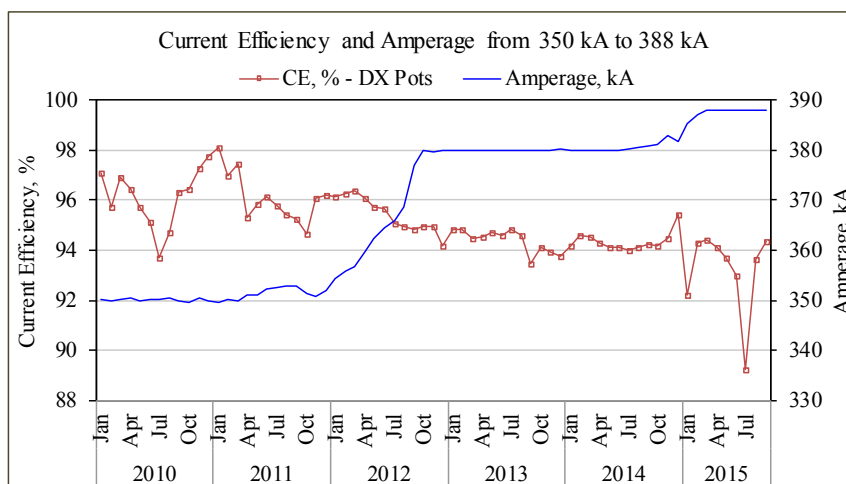
## 2. Pot ages and failures

The first pot was cut out in April 2014 for autopsy at the age of 1 559 days and pot replacement started on schedule from July 2014. Potlines 1 and 2 did not experience any pot failures until December 2014. The first pot tapped out on 19 December 2014 in Potline 2, followed by only three more cases, as shown in Table 1. So few tap-outs for two large potlines show that the DX lining design is very good and the pot operation is well controlled.

**Table 1. Failed pots in EMAL DX Potlines 1 and 2.**

Cell ID	Tap-out date	Pot age (days)
2B062	19-Dec-14	1761
2B085	08-Apr-15	1859
1B142	24-Jun-15	1653
2B181	27-Aug-15	1891

As a part of the cell relining schedule, 38 % of the pots were replaced by the end of August 2014. About 10 % of the pots cut-out were selected because of increasing iron content in the metal (0.15 % to 0.30 %). This iron was suspected to come from collector bar attack, but only approximately half of these pots were observed during delining to have damaged collector bars. The remainder probably had smaller multiple collector bar attacks, which could not be seen during delining. The age distribution of pots cut-out until 31 August 2015 is given in Figure 2 and the statistics are given in Table 2.



**Figure 16. Monthly average current efficiency of DX pots during amperage increase.**

## 7. Conclusion

EMAL Potlines 1 and 2 have successfully increased amperage from 350 kA to 388 kA, which increases the annual metal production by approximately 80 000 tonnes. The KPIs during the whole period were maintained at an excellent level. The potlining performance was also excellent with no failures during the first five years of operation. The potential for further amperage increase has been proven in DUBAL Potline 8, which opens the path to the future for EMAL potlines 1 and 2.

## 8. References

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