Improving Net Carbon Consumption at EGA with the Support of Anode Tracking and Butt Analyser

Tapan K. Sahu[1], Najeeba Al Jabri[2], Saleh Ahmed Rabba[3], Ali Jassim Banjab[4], Ahmed Al Marzouqi[5], Amer Al Marzouqi[6], Mariam Almarzooqi[7] , Bienvenu Ndjom[8], Pragasan Palavar[8], Rajwinder Kaur[8] and Edouard Mofor[8]

1. Senior Manager - Process Control Carbon and Port
2. Vice President - Technical
3. Vice President- Carbon and Port
4. Senior Manager - Plant Optimization and Process Development
5. Senior Manager - Carbon
6. Senior Manager - Baking Kilns
7. Lead Engineer - Industrial Automation and Control, Capital Projects
8. Lead Engineer - Process Control Carbon and Port

Emirates Global Aluminium (EGA), United Arab Emirates
Corresponding author: tksahu@ega.ae

Abstract

Emirates Global Aluminium has a smelting capacity of 2.5 million tonnes of hot metal per year from two production sites - Jebel Ali, which operates 6 different cell technologies, and Al Taweelah, which operates 2 different cell technologies. The original cells at EGA were started in 1979 at Jebel Ali with that plant expanded with more modern cell technologies at regular intervals since then. The Al Taweelah site was started up in 2009 and expanded in 2014. Improving the efficiency of the older cell technologies at EGA has been a constant pursuit which has included various initiatives undertaken over the last 10 years to improve Net Carbon Consumption (NCC). A reduction in overall smelter NCC from 436 kg C/t Al to 420 kg C/t Al has been achieved over this time, with the best performing technology delivering an NCC of 407 kg C/t Al. The requirement to procure raw materials from more than 10 global sources to supply several anode production facilities, and to operate multiple cell technologies, provided EGA with the unique opportunity to assess the impact of these variables on NCC. Changes in anode and cell design, improved anode quality, standardized and improved operational practices, along with optimized raw material usage, were key to delivering the NCC improvement. An integrated anode and rod tracking system and butt analyser were installed at Jebel Ali and this has provided an invaluable platform for integrating anode and cell data and analysis. The tracking system and butt analyser are pivotal in monitoring and fast tracking anode and cell improvements. This paper provides an insight into key factors influencing NCC at EGA and the tools used to evaluate their impact.

Keywords: Net Carbon Consumption (NCC), carbon raw materials, anode tracking, butt analyser, cell operations.

1. Introduction

Due to its regular expansion and capacity creep over the past 37 years, EGA now operates six different cell technologies at or above their design production capacities at Jebel Ali. This imposes stringent demands on cell control and raw material and anode quality.

One of the issues faced in efforts to improve anode performance for each of the cell technologies, was the difficulty of tracking the performance of anodes per technology or by Potroom. This is further complicated by the need to supply 8 different anode types across the smelter, produced from a single Carbon Plant.

Under these circumstances, evaluating the impact of initiatives to reduce NCC proved very challenging. In response to this challenge, a proprietary anode and rod tracking system was developed and installed to provide accurate data on anode production and usage. This was a “game changer” that provided new insights into anode behaviour within individual cells, cell groups, and Potrooms, so the impact of various cell and anode parameters on NCC could be quantified.

This paper describes how the anode and rod tracking system has been used to date as a tool for evaluating and optimizing NCC at EGA Jebel Ali Operations.

2. Anode and Rod Tracking Integrated System (ARTIS)

To handle the complexity of the EGA Jebel Ali site caused by multiple cell technologies using multiple anode types produced in single Carbon Plant, and to provide the data needed for process performance optimization, a strategic decision was taken in 2008 to install an anode and rod tracking system. The various commercial options available at the time were explored, but an ‘off the shelf’ fully integrated system meeting all of the requirements could not be found. Therefore, a decision was taken to develop in-house a modular system that could be expanded as technology continued to evolve. The anode and rod tracking system pilot trials commenced in 2008.

By 2010, EGA Jebel Ali had an operational Anode and Rod Tracking Integrated System (ARTIS) installed to provide extensive information about anode quality, usage, and performance parameters during the anode life cycle. Each rod assembly was uniquely identified, and this was linked to individually identified anodes.

Figure 1 below shows the equipment installed at various stages of the smelter process for rod and anode tracking. Each rod is fitted with a 2D barcode. Barcode readers for the rods and Optical Character Readers (OCR) for the anodes are installed at key locations in the Rodding Plant. Hand held readers are used to manually scan and record the cell/stall location of anodes in the Potlines [1].

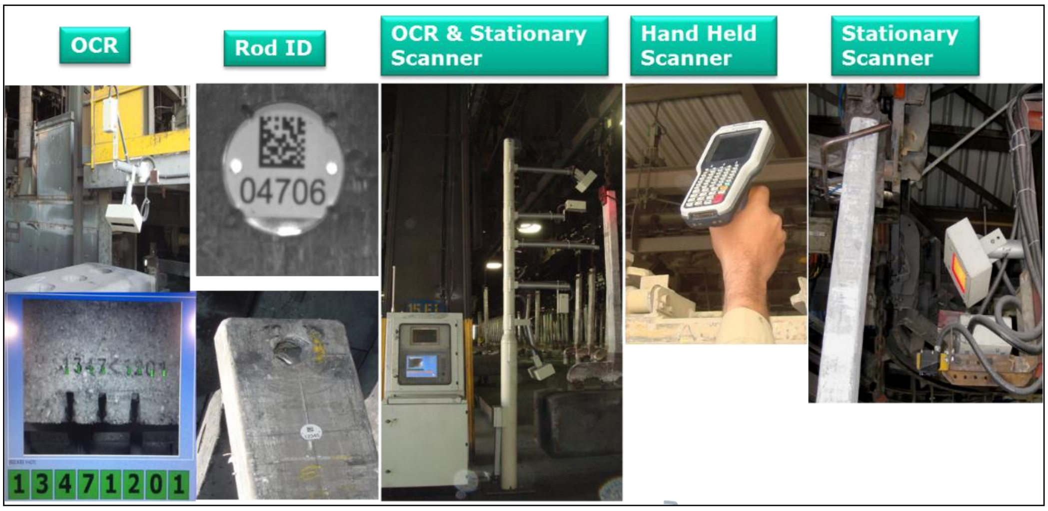

Figure 1. Rod and Anode Tracking Information System hardware.

As each rod ID is captured through the system, all the butt parameters, anode raw material information, and green anode parameters are linked to Potlines information such as: cell technology, cell number, stall number, and time of anode change (Figure 2).

and carbon team to utilize ARTIS has enabled EGA to select the most effective means for reducing net carbon consumption within the design limitations of its existing cell technologies.
ARTIS at EGA Jebel Ali has demonstrated its use as a reliable and integrated data system that not only facilitates but accelerates decision making processes. Evaluation of the initiatives to improve Net and Gross Carbon Consumption and diagnose the root cause of anode problems has been a major benefit of ARTIS. The data have also benefitted to minimise the effect of anode quality on metal purity and optimize the smelter process. Effective and faster evaluation of raw material performance and management of rod assembly repair have been other critical advantages.

The current anode and rod tracking information system does an excellent job of cross area information linkage. However, the traceability of baked anodes with regards to baking parameters is limited to the anodes that are sampled for quality verification. EGA is exploring the option to implement the anode tracking within the baking furnace to improve the association of baking parameters with ARTIS. This will provide additional opportunities to understand the performance of anodes that are baked in different locations/situations in the baking furnaces and unlock prospects for furnace efficiency improvements.

Acknowledgements

We would like to express our sincere gratitude for the contributions of those involved in the various initiatives to implement ARTIS and utilize the system to improve anode performance at EGA. Our Special thanks to the Potlines Management Team for their support and close follow up of plant trials in the Potlines.

References

1. Edouard G. Mofor, Use of ARTIS to improve smelter performance, Gulf Aluminium Council Carbon Seminar, Dubai, 21 November 2016.
2. International patent application WO 2016/097 968, «Anode Rod Tracking System for Electrolysis Plant».
3. Tapan K. Sahu, Improving anode performance through anode quality improvement at Dubal carbon plant, 11Th Australasian Aluminium Smelting Technology Conference, Dubai, UAE, 6-11 December 2014, Paper 06M4.