Improvements in Baked Anode Quality through Reducing Process Variations and Debottlenecking Carbon Plant

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Abstract

EGA has long-focused on continuously increasing production through amperage increases and technological upgrades. Currently the capacity of the carbon plants has reached its maximum limit and therefore, it has become very important to focus more on improving quality through reducing process variations and debottlenecking critical equipment. Based on customer needs, critical baked anode quality KPIs were identified and prioritised with targets. This became the steppingstone for developing a network of opportunities across different process steps, e.g., linking the shopfloor practices with the final baked anode quality, improving efficiency of the critical equipment through upgrades, optimisation of the internal processes, and taking operation to the next level with the utilisation of Industry 4.0 tools. Also, to empower the employees, Carbon & Port management created an interactive platform through a quality campaign that emphasised personal ownership and teamwork towards quality. This paper narrates the challenges, which were faced starting from raw materials to anode performance in potlines and the response plans in mitigating them during the anode manufacturing process.

Keywords: Baked anode quality, Debottlenecking critical equipment, Industry 4.0, Process optimisation, Reducing process variation.

1. Introduction

EGA is the world's biggest ‘premium aluminium’ producer with business from mining and refinery to smelting and casting. EGA produced a record 2.653 million tonnes of hot metal in 2022 in its two production sites, Jebel Ali and Al Taweelah as per Figure 1. Carbon plant is an important enabler to EGA’s metal production, with more than 1.39 million tonnes of anodes produced for both Jebel Ali and Al Taweelah of different sizes to meet the production requirement. It has become crucial that the carbon plant produces anodes of the required quality especially as most of the technologies in EGA reached their optimum design limits.

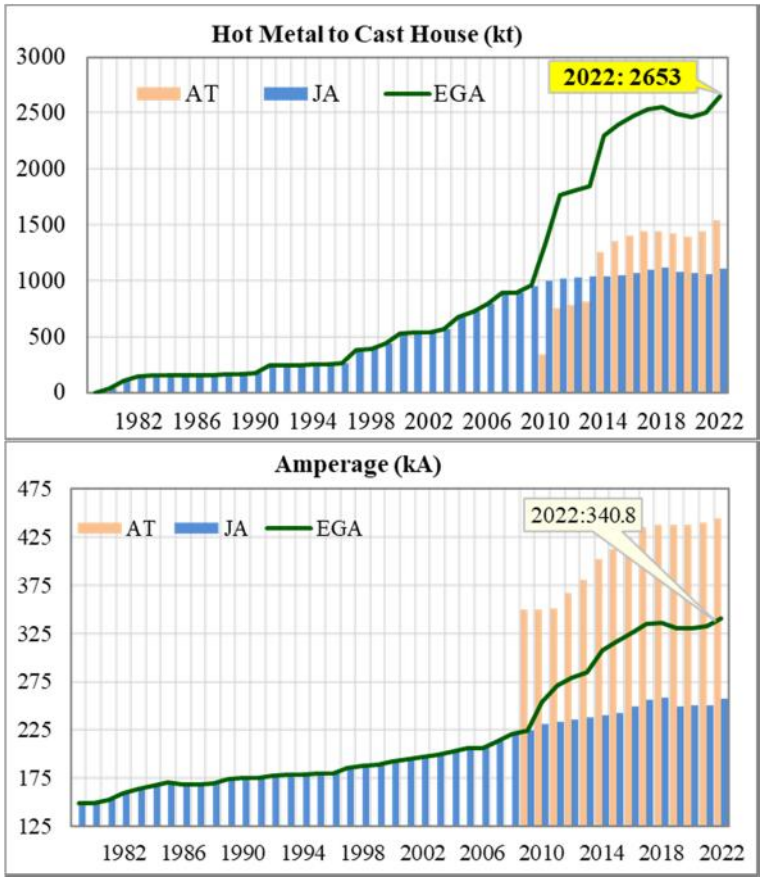

Figure 1. EGA's hot metal production and amperage.

As EGA continues its amperage increase strategy there are multiple challenges which were identified by both Potrooms and Carbon plant that had to be addressed in order to achieve the strategy. Figure 2.

The main key challenges are summarised below for both potlines and carbon plant.
Potroom key challenges during amperage increase:

- Increased anode current density,
- Reduced anode-cathode distance,
- Sustaining pot internal heat.

Carbon plant key challenges:

- Debottlenecking the carbon plant to meet the increased anode requirement,
- Reduce anode quality variation,
- Tighten the raw material specifications.

Based on the above challenges it became evident that the carbon operational strategy had to be aligned with the potroom plan of achieving higher productivity while improving pot stability with reduced anode problems. In order to achieve this, EGA Carbon & Port has transformed its anode production process compliance by aligning the anode quality strategy with customer expectations in the potline and EGA's business strategy for amperage increase. Carbon & Port has prioritised the commitment to quality in its process compliance efforts. As a first step, a Service Level Objectives (SLO) were established to define compliance targets for critical anode quality indicators, including electrical resistivity (ER), carboxy-reactivity dust (CRD), the average crystallite size (Lc), and baked apparent density (BAD). These indicators were selected

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16. References

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